

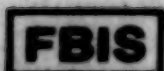
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# USSR Report

CHEMISTRY

No. 69



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11 April 1980

## USSR REPORT

## CHEMISTRY

No. 69

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PART I  
Chemical Industry

PRODUCTION EFFICIENCY CALLED FOR

Moscow TRUD in Russian 12 Dec 79 p 2

[Article by A. Kuramzhin, deputy minister of chemical and petroleum machine building: "The Main Criterion is Production Efficiency"]

[Text] One of the important tasks now faced by the workers of the national economy is the most rapid implementation of the decree of the CPSU Central Committee and the USSR Council of Ministers "On improving planning and intensification of the action of the economic mechanism to increase production efficiency and work quality." Further dissemination of scientific organization of labor at the enterprises of the country will largely contribute to fulfillment of this task. NOT [Scientific organization of labor] will help to efficiently utilize work time, increase labor productivity and reduce product cost.

The greatest saving can be achieved in complex introduction of NOT at all production levels: job sites, sections, in shops and throughout the enterprise as a whole. It is this approach to the problem that is typical for the collective of Uralkhimmash [Ural Heavy Chemical Machinery Plant]. The first plans of NOT at job sites were developed at this enterprise at the beginning of the 1960's. The association is now the leader of the sector in complex introduction of NOT into production.

Implementation of typical NOT plans in sections and shops makes it possible to achieve smooth work of the entire collective, to improve repair and other servicing, to develop collective forms of labor and to organize combining of occupations.

It is no accident that the level of brigade organization of labor--57.9 percent--is highest in the sector at Uralkhimmash. More and more workers --27.7 percent--are combining occupations. The movement of multimachine-tool operators is expanding. Approximately one-fourth of the association's machine-tool operators now work in this way. A total of 170 brigades fulfilled the tasks of four years of the five-year ahead of schedule by using efficient organization of labor on a scientific basis. And 31 brigades are working on the account of the 11th Five-Year Plan.

The creative cooperation of workers and engineering and technical personnel must be developed more broadly for successful introduction of NOT plans and workers' initiative must be reinforced by engineering support. In this regard Uralkhimmash is also the leading collective in the sector. A total of 192 agreements on creative cooperation has been concluded in the association. More than 1,700 workers, engineers and technicians participate in implementing them. The total saving from this joint work comprised more than three million rubles.

The experience of Uralkhimmash is finding wide dissemination in the sector. Moreover, it is important to note that the Ural experience of introduction of NOT is being creatively developed at the enterprises and in the associations and it is being used with regard to specific production conditions.

For example, let us take the Omsk Oxygen Machine Building Plant. Protection of the counterplans and socialist pledges before the public committees is practiced successfully here.

Public defense of the counterplans being used, justification of them by NOT plans and recruitment of additional reserves produce a great saving. The enterprise's counterplan provides for product sales worth 300,000 rubles above the plan for this year, a saving of 100 tons of ferrous metals, 1.7 million kilowatt-hours of electric power and more than 300 tons of fuel.

A complex system of controlling production efficiency has been developed at the Sumy Machine Building Association imeni M. V. Frunze. An important part of the system is extensive introduction of scientific organization of labor. The effect is significant--the Association imeni Frunze increased profits 1.5 times during three years of the current five-year plan, production capacity is being utilized at 98 percent and additional products worth 3.7 million rubles have been produced by improving the use of equipment and reducing losses of working time. It is planned to fulfill the 1979 plan for gross production on 28 December.

An interesting form of socialist competition, the so-called "efficient labor system" (SET), developed at the Scientific Production Association Lenbummash imeni Second Five-Year Plan, has achieved support and extensive dissemination in the sector.

The basis of the competition is complex NOT plans at each job site. In organization, this appears thusly: all workers are divided into three groups. There is an approximately equal level of labor productivity in each one. The purpose--by introducing NOT, to achieve the same level of labor productivity in each group as in that of the leaders. The incentives system has also been constructed on this principle. The collective of the association reduced the number of lagging workers more than one-third and increased labor productivity an average of 10-12 percent during the current five-year plan.

The ministry has worked out and introduced an effective system of determination and use of intraplant reserves.

Leonid Il'ich Brezhnev said at the November Plenary Session of the CPSU Central Committee that one of the main trends of organizational, mass political and ideological work with respect to current national economic tasks is support and dissemination of leading experience and leading forms and methods of work which contribute to an increase of labor productivity. Extensive introduction of scientific organization of labor is of important significance in realizing these tasks.

At the same time, a number of timely problems discussed at the seminar must be solved for further development of NOT, including problems of organization of centralized production of organizational equipment, development of new standard designs, development of brigade forms of organization of labor and so on. Solution of them will assist further distribution of NOT and this means an increase of social production efficiency.  
[96-6541]

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CSO: 1841

## DELAYS IN CONSTRUCTION OF KEMEROVA UREA PRODUCTION COMPLEX

Moscow STROITEL'NAYA GAZETA in Russian 19 Dec 79 p 2

[Article by V. Kulik, deputy general director for construction of the Production Association Azot: "Don't Be Late For The Deadline"]

[Text] For some reason the Kemerova Urea Production Complex of the Kemerova Association Azot, with capacity of 450,000 tons of product annually is being constructed slowly. A total of 49 million rubles of capital investments has been allocated for the Kemerova workers and imported equipment has been delivered on time.

Unfortunately, there is no cause for joy at our construction project. All the construction-installation work must be completed now according to the plan and the first urea must be produced next year. However, hopes of producing a product within the directive deadline are dying along with the departing year. Only about three of 14 million rubles for construction-installation work have now been assimilated. And this is with the presence of all the required equipment concentrated on the site, on loan for which the Association Azot has to pay Stroybank an increased percent.

We feel that the interruption occurred primarily due to miscalculations of the planning bodies which ignored the real capabilities of the contracting organizations of Kemerovskaya Oblast. Whereas the mean annual volume of construction-installation work for all objects of the association Azot comprised 14 million rubles during the previous five-year plan, this sum was now required for the urea plant alone. And we have three additional large plants in the title list, the planned start-up of which did not take place in 1978: a caprolactam plant, dilute nitric acid plant and an ammonia nitrate and sulfuric acid plant. All the planned work (together with the urea plant) was estimated at approximately 40 million rubles--almost three times higher than the actual 1975 indicator.

The construction organizations of the Kuzbass were clearly incapable of resolute planning of similar jumps. They were able to raise the annual assimilation only to 24.7 million rubles during the reporting period, which did not permit [Translator's note: part of text missing].



Much time and labor was lost on revision of the technical solutions even after the beginning of construction of the urea plant. Specialists of the Dzerzhinsk Branch of GIAP [State Scientific Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis] of Minkhimprom [Ministry of the Chemical Industry] designed the building on a basis which would not tolerate the Siberian climate. Willingly or unwillingly, they had to convert to pile footings, although the builders managed to install individual buildings at that time. A high price had to be paid for the miscalculations of the designers.

All the problems which previously interfered with the shock work of the builders and installers have now been practically eliminated. However, the urea plant still remains in the position of a stepchild as before. The contractors engaged in starting up the other objects seemingly forgot about it.

At the end of June Gosplan of the USSR obligated Mintyazhstroy [Ministry of Heavy Construction] of the USSR, Minmontazhspetsstroy [Ministry of Installation and Special Construction Work] of the USSR and Minkhimprom to work out and implement measures to introduce the caprolactam, dilute nitric acid and ammonium nitrate and sulfuric acid plants and to create the necessary atmosphere at the urea complex required to start it during the first half of next year. The program was realistically corrected. And Glavkuzbasstroy [expansion unknown], although timidly, began to increase efforts at the urea objects. And now the organizations of Minmontazhspetsstroy of the USSR, especially the Sibstal'konstruktsiya Trust [expansion unknown] are seemingly ignoring the important construction project. Although Sibstal'konstruktsiya has the most responsible tasks. There are now only 150 installers here and ten times more are needed. With this attitude, there may be no urea even in 1980.  
[96-6521]

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CSO: 1841

## UREA PRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Dec 79 p 1

[Article by M. Yakovlev: "There is Urea!"]

[Text] The builders of the Donetskyazhstroy Combine and its contracting organizations endured start-up drudgery for two years at Gorlovka. The task was not a simple one--to put into operation two large-capacity ammonia plants with output of 450,000 tons each annually and a urea complex with the same productivity. All three objects were compactly arranged on one comparatively small area. The ammonia installations are already operating and are providing hundreds of thousands of tons of raw material to customers for nitrogen fertilizer production. The urea plant emerged last on the readiness line.

The unit method of delivery and installation of equipment was used here. Its essence is that units, fittings and various articles were made into complete sets at the warehouses strictly according to specific subassemblies. After it was installed a new consignment is received. The installers earlier attempted to take that which is required both tomorrow and a week later. But bolts, valves and similar small parts were frequently lost with this procedure and squabbles began as to who was guilty. These cases were rare at the urea plant.

The new procedure of making up complete sets is a logical continuation of the unit method of organization and control of start-up complexes which was born in its time in construction of the mill 3600 of the Azovstal' Plant. But it was possible only for the first time to achieve synchronous actions of the builders and customer service. And this is the result of extensive efforts of the party staff of the construction projection, which applied much effort to see that the slogan "Workers' relay race" "From mutual complaints to mutual help!" became the norm in relations between all participants of construction.

There were also difficult sections at the construction site. Thus, for example, erection of the granulation tower lagged behind the starting schedule. The best brigades of installers headed by Hero of Socialist

Labor A. Kaverin, L. Arabskiy and M. Chichkan', were sent here to raise the object. The installation aces did not let us down--they turned over the complex equipment of the granulation tower for adjustment within the deadline. The brigades of insulation workers A. Kholopko, installers of assembled steel sections M. Chudnov, builders P. Troyanov and N. Fedorov and machine installers I. Kupin and S. Osaulenko labored excellently during the final days. They achieved the best results in the composition for worthy celebration of the 110th anniversary of V. I. Lenin's birth, the intensity of which was especially high during the pre-starting days.

And now the busy time is behind. A meeting of the workers committee, which decided to begin bringing the installation to operating conditions, was just finished. The directors of the new plant, technicians and adjusters assembled in the room of the central control console. Everyone is looking at the numerous signal lamps and devices. They are excited--urea production is a new matter for the Gorlovka chemical workers. And the first granules, similar to rice groats, are just as carefully passed from hand to hand by all those present.

"With introduction of the urea complex into operation," says the general director of the Stirol Association P. Apatkin, "the increase of capacities for mineral fertilizer production provided by the five-year plan has been completed at the enterprise. We will now produce almost one million, or rather 990,000 tons more. The collectives of the new shops pledged to assimilate the capacities ahead of schedule in honor of the 110th anniversary of V. I. Lenin's birth.  
[96-6521]

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CSO: 1841

**ECONOMIC AND MATHEMATICAL METHODS OF STIMULATING THE DEVELOPMENT AND  
DISPOSITION OF THE PETROCHEMICAL INDUSTRY**

Moscow **PLANOVOYE KHOZYAYSTVO** in Russian No 11, 1979 pp 73-79

[Article by N. Bredikhin, chief specialist of the main computer center of Gosplan of the USSR, A. Saltykov, subdepartment chief of Gosplan of the USSR, Ye. Dmitriyev, chief specialist of Gosplan of the USSR, and T. Kabanova, head engineer of the main computer center of Gosplan of the USSR]

[Text] The rapid rates of development of the petrochemical industry and its numerous and complex economic and technological relationships make problems of using economic and mathematical methods and computers in solution of problems of territorial disposition of the main petrochemical product plants timely. These methods permit a significant increase in the level of the economic work and justification of decisions made both in the ministries and in the departments of Gosplan of the USSR.

The Department of the Chemical Industry of Gosplan of the USSR took a number of problems in 1976 for operation in the first unit of the ASPR [Automated control system for planning calculations], including that for optimization of development and disposition of the tire industry, the mechanical-rubber products industry, the commercial carbon industry, the synthetic rubber industry and organic synthesis products plants for long- and medium-term planning conditions.

Introduction of economic and mathematical methods was begun with solution of the simpler problems. Thus, for example, optimization calculations were carried out on simplified models when working out the draft of the plan for development of the national economy for the Eighth Five-Year Plan and forecasts for the long-term prospects. Specifically, the open model of the transport problem was used in the tire industry. Accomplished on a first-generation computer, it permitted for the first time formalization of the problem of development and disposition of the tire industry and solution of it with simultaneous consideration of production and transport factors, reaching an optimum throughout the sector as a whole.



The multiproduct production-transport static model is now used in practical calculations at the GVTs [Main computer center] of Gosplan of the USSR. Its entire function permits selection of the best from the viewpoint of the total minimum production and transport expenditures from the set of formally permitted plans (several hundreds of versions of them are usually reviewed).

Let us consider the system of model restrictions in more detail on the example of the tire industry.

One of the important conditions of the problem is meeting the regional needs for finished products during the whole year of the corresponding planning period. Territorial balances of production and consumption are constructed on the basis of the total needs of the national economy for tires or for corresponding groups of tires with regard to their manufacture locally and also import and export.

The volumes of production for each group of tires at the plant are limited by the maximum levels of typical capacities at new plants and calculated capacities (with regard to the increase and reduction of capacities) at existing tire plants.

Taking into account that specific expenditures fluctuate considerably by groups of tires in the tire industry, all the expenditures in the model, including one-time expenditures, are differentiated by groups of tires.

The total production-transport model is also used to solve problems of the development and disposition of the mechanical-rubber products industry, the commercial carbon industry, synthetic rubber industry and olefin production industry and products based on them.

The technological characteristics of the mechanical-rubber products industry permit simplification of the model, reducing it to a single-product model which sharply reduces the number of total variables and also consumption of machine time.

The model of development and disposition of the commercial carbon industry is characterized by multistage nature of the relationships from receipt of the raw material and its working mixtures to production of the final product and distribution of it to consumers. The significant effect of the composition and distribution of raw material resources for disposition of the commercial carbon industry closely links this sector to the petroleum refining industry.

Problems of the development and disposition of the synthetic rubber and olefin production and olefin-based products industries are solved as multistage problems with complex technological relationships which include production and transport of raw material, monomers and finished products.

The product nomenclature includes those types for which a significant increase of production or maintenance of it on significant scales is proposed in the future. These problems are characterized by a wider scope of various types of raw material, technological methods of production and intermediate and finished products.

The volumes of production, the selection composition of the product of enterprises, the relationship of new construction and development of existing plants, problems of specialization, combining of production, inter-rayon transport communications and also the volumes of capital investments, operating expenses, estimates of the optimum plan and other indicators are determined as a result of problem-solving.

The volume of the information fund on problems of development and disposition of sectors of the petrochemical industry comprises 15-20 million characters at GVTs of Gosplan of the USSR, of which approximately 50 percent is input data needed to solve problems and the same volume of output information which characterizes the results of calculations in different profiles.

Preparation of the input information for manual optimization calculations by only a single problem requires expenditures of approximately 2,000 man-days or eight man-years. In this regard the problem of automation of preparation and processing of input information became the primary problem of the leading specialists of GVTs of Gosplan of the USSR. Calculation of the indices of transport expenditures was converted to computer in 1965. The mathematicians subsequently compiled a complex of programs on formation of calculating matrices for solving distribution problems.

In 1973 the collective of specialists of TsEMI [Central Economic Mathematics Institute] of the USSR Academy of Sciences and GVTs of Gosplan of the USSR worked out methods and a complex of programs for formation of calculating matrices and output tables with the results of solving problems of general line programming. As a result, this complex of programs based on generalization of the experience of calculations on problems of the petrochemical industry was improved considerably. Formation of the transport block was essentially almost completely automated and the level of automation comprised no less than 80 percent for the production block. Reduced expenditures were calculated in the automatic mode in both blocks.

The effectiveness of automation of preparation and processing of input information is characterized by the following indicators: labor productivity was increased 50-fold, including 500-fold for the transport block; the period of recovery of one-time expenditures for automation comprised 0.4 year.

The developed complex of programs permits calculation of a number of analytical indices in automatic mode and issue of the results of calculations in tabular form in formats which approximate planning documents.

The indicators of the plan are grouped into four sections of output forms: the volumes of production and use of production capacities, transport-economic communications, expenditures expressed in costs and the effectiveness and stability of plans. Each group contains a set of specific tables which differ by the composition and content of the corresponding full-scale and cost indicators for types of raw material and products throughout the sector as a whole and in regional profile by items, economic regions and macrozones. The synthetic indicator of total reduced expenditures is differentiated by the types and elements of expenditures and also by the technological structure and the structure of reproduction.

Fifteen years experience of conducting optimization calculations in the petrochemical industry showed that their basis should be periods of five, 10 and 15 years, beginning the counting of time from the first year of the next five-year plan. The widest range of optimization is related to a period of 10-15 years. Multivariant calculations for different levels and structures of the possible needs of the national economy for corresponding products of the petrochemical industries and for raw material resources for petrochemistry are carried out at this stage. The main purpose of the calculations made from models of development and disposition for the next five-year plan includes determination of the optimum selection of products of the petrochemical enterprises and also making control calculations to determine the optimum capacity of the enterprise.

Optimization calculations are made at different levels of aggregation of product nomenclature and the territorial grid as a function of the posed purpose and selection of the planning period. Calculations were made for 4-10 groups of tires and for individual sizes in the tire industry. Optimization calculations for individual tire sizes are made comparatively rarely and usually have a strictly purposeful designation related to adoption of a specific decision at one of the last stages which determine the beginning of construction of a large object.

One of the important aspects of selecting the optimum version for development and disposition of a plant is consideration of the time factor. This is accomplished in the static model by recalculating the capital investments by the formula of complex percentage using the coefficient  $r_n$ , which characterizes the increase of calculating expenditures due to the effect of the time factor:

$$\Psi_{rn} = E \sum_a \zeta_a \quad \text{for all values of } r \text{ and } n;$$

$$\zeta_a = (1 + \frac{E}{2}) \sum_{\tau=1}^{T_r} P_{r\tau a} [(1 + E\lambda_a)^{\tau+1} (1 + E\lambda_a)^{\tau+2} \dots (1 + E\lambda_a)^{T_r}]$$

for all values of  $r$  and  $\alpha$  ;

$$\sum_{\alpha} p_{r\alpha} = 1 \text{ for all values of } r,$$

where  $\zeta_{\alpha}$  is the coefficient of calculating expenditures of capital investments for the  $\alpha$ -th unit;  $T_r$  is the period of construction and assimilation of the  $r$ -th variant of capacity;  $P_{r\zeta}$  is the normative fraction of capital investments assimilated in the  $\zeta$ -th mode and the  $r$ -th variant of capacity;  $\lambda_{\alpha}$  is the norm for assimilation of capacities by units; and  $E$  is the normative coefficient of the effectiveness of capital investments.

Using the coefficient of calculated expenditures  $\psi_{rn}$  permits one to take into account a number of important factors which bring the static model closer to the dynamic model.

The saving due to optimization was determined on the example of the tire industry by comparison of expenditures calculated for the variant of the sector development plan worked out by the traditional method to expenditures by the variant of the plan obtained by using linear programming methods and computers.

The value and structure of the economy of reduced expenditures, obtained as a result of optimization of the development and disposition of the tire industry for 1980, are presented below:

	Rubles/unit	Percent
Saving-total	1.26	100.0
Including due to:		
efficiency of disposition	0.33	26.2
strengthening of capacity	0.60	47.6
combining	0.33	26.2

On the whole, the saving is expressed in a reduction of reduced expenditures by 11.7 percent without regard to the cost of raw material. The absolute value of the saving, calculated for the planned volume of tire production, comprises approximately 60 million rubles for 1980, of which approximately 48 million rubles is due to more rational development and disposition of new enterprises and approximately 12 million rubles is due to higher rates of increasing production capacities at existing enterprises put into operation prior to 1963.

The given calculation is approximate. It does not take into account the economy achieved with optimization in transport expenditures and also a number of additional expenditures. However, according to expert analysis, the latter are considerably below the saving in transport expenses.



The experience of using optimization calculations shows that deviation from the optimal variants of plans usually leads to significant overconsumption of funds in the national economy. Thus, the proposal of transferring construction to another macrozone was received in 1976 during consideration of the technical and economic justification for construction of the Second Belotserkov' Tire Plant. However, additional calculations made with regard to the entire complex of factors which takes into account differentiation of expenditures for construction and installation work by regions, equipment, electric and thermal energy, wages and transportation of raw material and products showed that the proposed deviation from the previously derived variant causes additional expenditures in the amount of 15-20 million rubles annually. It was established in 1977 when determining the assortment of tires at two plants planned for construction at the Department of the Chemical Industry, that variation of the assortment of tires at these enterprises leads to an increase or decrease of transport expenditures in the amount of up to four million rubles annually as a function of the variant used, despite the fact that the plants are located within the same macrozone.

The saving was also calculated on optimization of development and disposition of olefins and olefin-based products. Variants of the development and disposition of the petrochemical industry, developed by the traditional method of VNIPINeft' [All-Union Scientific Research and Planning Institute of Petroleum Enterprises] and optimized by using economic and mathematical methods and computers, were considered. Identical resources of initial raw material and volumes of production of finished products were taken for purposes of the comparability of the scheme to the results of optimization calculations in the compared variants. The saving of the optimum plan was expressed in a reduction of expenditures by 93 million rubles in monetary units.

Economic and mathematical methods, as indicated by experience, can be effectively utilized not only to obtain an optimum variant of the plan directly but also for careful analysis of the input information and of various parameters introduced into the model.

A complex of facilities which provides optimization calculations of the development and disposition of sectors of the petrochemical industry in the medium- and long-term planning mode has been created and is functioning at GVTs of Gosplan of the USSR.

An information fund of input data, which ensures optimization variant calculations within the corresponding periods upon request of the departments of Gosplan of the USSR, has been formed for each local problem turned over for operation.

The Department of the Chemical Industry does not consider problems of the development and disposition of individual sectors and larger objects without making the corresponding optimization calculations and careful economic analysis of them at GVTs of Gosplan of the USSR.

Working groups on development and disposition of sectors of the chemical and petrochemical industry have been created in the Department of the Chemical Industry to ensure an operational nature of calculations. They include specialists of the corresponding subdepartments of Gosplan of the USSR, GVTs of Gosplan of the USSR, ministries and branch planning and scientific research institutes. The results of optimization calculations, the status of the information fund, the need to carry out refining variants of calculations and so on are considered by individual subsectors at meetings of groups or subgroups.

Complex solution of local problems is based on calculation of the set of factors which determine the internal and external relationships of the optimized system.

Not only the technological characteristics of the product output with regard to the planned and predicted scientific and technical progress, but also the general principles of disposition of the industry and social and economic factors are taken into account when forming the conditions of the problem and indicators of the entire function.

The national economic approach to solution of individual sector problems is also accomplished by using estimates of closing expenditures in regional profile for energy, fuel, transport and labor resources and also capital investments. This makes it possible in local calculations to reflect the limitations on resources which occur in other problems and subsystems. The use of estimates here is a purely technical means which permits linking individual problems to each other to a specific degree.

Analysis of the mechanism of interaction of the raw material, semi-finished product and product blocks combined in the model shows that they are optimally tied in by formation of estimates and closing expenditures for the corresponding types of raw material and semi-finished products. Closing expenditures for the finished products are a means of matching a given system to related plants which are the consumers of the finished products of the optimized system. The latter is related to other external systems by means of information exchange at the input and output on the types of resources consumed and produced.

One of the conditions for functioning of the system is determination within each individual problem of the product nomenclature and raw material by which related subsystems are joined. The second condition is to provide stability of the output indicators which enter other subsystems. Closing expenditures should be more stable than direct expenditures since they have a range within which variations of direct expenditures are not reflected in their value. Indicators of closing expenditures can be calculated on three levels (minimum, average and maximum) of initial resources and needs for finished products. The third important condition directly related to the second is to check all local problems for the correctness of postulation. This is true of boundaries of localization of problems, the set of

technological methods of production and so on. The fourth condition is development of a unified methodological base for information support and making optimization calculations and the fifth is organization of calculations and exchange of information for different problems. A general coordinated plan which determines the sequence of calculations and the method and periods of information exchange is required for this.

Problems of the development and disposition of the fuel and energy complex, which includes in combined form the petroleum refining block, should be solved at the first stage of functioning of the calculation system. Problems of the development and disposition of the petroleum-producing and petroleum-refining industry and also the gas-producing and gas-refining industry are solved during the second stage in a nomenclature corresponding to the requirements of the petrochemical and chemical industries. Problems of optimization of development and disposition of coal-tar chemical raw material production are accomplished at this same stage. Problems of this type for a number of sectors of machine building, which are the main consumers of mechanical-rubber products and tires, should also be accomplished during the first two stages. Problems of the development and disposition of olefin plants and olefin derivatives and commercial carbon are solved during the third stage. The latter can be transferred to the next stage if extensive use of heavy types of pyrolysis raw material is provided in the problem of olefin hydrocarbons. The problem of the development and disposition of synthetic rubber production is solved at the same stage. Calculations on the development and disposition of the tire industry and of mechanical-rubber products are made during the fourth stage.

Along with local problems, a summary model of the multisector petrochemical complex can be formed for the long-term in which the possibility of sufficiently wide aggregation is represented.

Experimental calculations on the model of the fuel and petrochemical complex developed by TsENII [Central Scientific Research Institute of Economics] attached to Gosplan of the RSFSR, are now made at the GVTs of Gosplan of the USSR. It includes oil, natural and casing-head gas, gas condensate and coal production and production of other types of solid fuel, refining of crude petroleum and gas hydrocarbons and export of them. Calculations are made throughout the country as a whole in the profile of 18 rayons and 52 products. Practical realization of this model and further development of it will permit solution of a number of important problems related to optimum distribution of resources and obtaining cost estimates of the various types of hydrocarbon raw material, which is the basis for growth of the petrochemical industry. The characteristic feature of this problem is that it is first solved as a unified model with wide nomenclature of products of sectors of the fuel and petrochemical complex rather than as a system of individual problems.

The typical feature of the new stage of using economic and mathematical methods in the petrochemical industry is the complex approach and tying-in

individual local and complex problems into a unified system of models. Improvement and introduction of problems of optimization for individual sectors into planning work is being continued along with this.

The foregoing permits one to say that the base necessary for development and introduction of a system of optimization calculations during the 11th Five-Year Plan, which completely encompasses this sector of industry, has already been created in the sectors of the petrochemical industry.  
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## SHORTAGE OF HOUSEHOLD CHEMICAL GOODS DECRIED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Dec 79 p 2

[Letters from readers and answer by L. Kostandov, minister of chemical industry: "Multiface Chemistry"]

[Text] "Chemistry is customarily called 'magician.' This is understandable. From the first years of its rapid development this young sector of the national economy brought us one surprise after another. It gave us plastics, synthetic fabrics, magnetic tape, stable varnish, new building materials and footwear. Now, having become acquainted with its richest capabilities, we ourselves expect more and more from it. I would like to know what new things chemistry will bring us in the next few years."

Yu. Il'ichev,  
engineering inspector  
Tselinograd

I would like to say right away that it will not be a question of miracles, because it is difficult to surprise our contemporary man with scientific and technological achievements. We live in a dynamic age, when, in practice, every day brings us some discoveries. Therefore, I will discuss only some of our present and future concerns.

Now we pay much attention to the development of new types of chemical fibers. Discussing their utilization, you will first mention clothes. Our scientists have concluded that their quality can be greatly improved by bringing the properties of fabrics made of chemical fibers closer to those made of natural fibers. Large-scale production of high-modulus viscose fiber capable of replacing cotton, which is now scarce, will be soon put into operation. This fiber conducts moisture, "breathes" well, lends itself easily to dyeing and is worn excellently.

However, concern for clothes is one aspect of the matter. The area of application of synthetic fibers is much broader. They have an especially great future in industry. Does electrical engineering need a fabric that

conducts electricity? We have developed it. We have just obtained fibers exceeding the strength of steel. A fireproof fabric, which can be used to cover walls in public buildings, steamships and airplanes, has been developed. I must mention another type of fiber--semipermeable. It will be widely used for sewage cleaning.

It is no secret to anyone that the fertility of our fields, orchards and gardens is also the concern of chemists. As calculations show, every ruble spent on mineral fertilizers, for example, on sugar beets yields 3.5 rubles of profit. We are now working on the development of fertilizers that would be applied in smaller quantities to the soil, but the effect from this would be greater. They are primarily highly concentrated and complex fertilizers. Why complex? Because they will contain a whole complex of elements necessary for the rapid development of plants. Ultimately, they need almost the entire "Mendeleyev's table."

Many interesting things can also be said about highly pure substances--so-called complexones and complexes--for which our scientists were awarded the USSR State Prize. With them it is possible to treat fur bearing animals, control grape diseases and prevent scum formation in thermal and power equipment. They will also find the widest application in perfumery, the food industry and biology.

From this information you can judge how rapidly and persistently chemistry captures positions in all the national economic sectors without exception.

"A great deal is now written about the need for a more global approach to the protection of nature. A number of party and government decrees also discuss this. The chemical industry is one of those to blame for environmental pollution. What measures are envisaged to prevent this undesirable effect?"

L. Timofeyeva,  
physician  
Saratov

With regard to the widespread view that chemistry is one of those mainly to blame for environmental pollution, it is not quite accurate.

During the last 4 five-year plans the Ministry of Chemical Industry has spent more funds on natural protection measures than any other industrial ministry. These funds are used to establish a wide network of sewage cleaning installations, dust and gas collecting systems and drainless production facilities operating in a closed cycle.

I would like to note another important factor: Systematic work on taking shops and production facilities with obsolete technology out of service

has been done during the last 2 five-year plans. More than 400 shops and production facilities were closed and reconstructed during the Ninth Five-Year Plan alone and another 350 are to be closed during this five-year plan. As a result, an amount of water sufficient for 20 large modern chemical plants will be saved. Furthermore, the amount of discharge into reservoirs and the atmosphere will be reduced significantly. Of course, we will still have to do a great deal so that our enterprises do not inflict any damage on the environment. And we will do this.

"I am disturbed by the difficulties connected with apartment repairs. One goes shopping and often to no purpose: Now the necessary paint, now a good wallpaper glue, now a varnish is not available. I think that our situation with respect to household chemical goods is by no means satisfactory."

N. Mikhaylov,  
Elektrogorsk

It should be stated that the industrial production of household chemical goods on a good technical level began in our country only at the end of the 1960's. Household chemistry is now a large subsector fitted with modern equipment and capable of solving major problems connected with the development of chemical goods for the people. For example, such goods worth 2 billion rubles more than 10 years ago will be produced in 1980. We have already manufactured more than 800 types of such goods.

It should be stressed that every new item is the result of prolonged research, careful preparation and often a fundamental reorganization of production. Only the goods that have some new properties and are of a much better quality as compared with their predecessors receive the right to industrial output.

I would like to mention some new household chemical goods. They include bleaches with an antistatic and disinfecting effect, Blik, a new cleanser for dish washing, Sanfor, for toilet cleaning and a liquid for cleaning plastic surfaces. New glues, that is, Moment-1 for general purposes, a household glue for facing materials and BIF for regular and photographic paper, will appear on the counters of stores for household goods in the next few years. New preparations in aerosol packaging have been developed.

However, the output of goods for the people still lags behind the demand. The insufficiently wide assortment, quality of some types of chemical goods and shortage of products in great demand should also be reproached. For example, the output of synthetic detergents still lags greatly, for which we are correctly criticized. The ministry has developed measures to increase the production, to expand the assortment and to improve the quality of synthetic detergents in 1980 and during the 11th Five-Year Plan.

The shortage of new wall paints, wallpaper glues, varnishes and enamels is also perceptible. At present the enterprises of the Ministry of Chemical Industry manufacture up to 70 types of varnish and paint materials for cultural and general purposes, but this is not enough. The limited nature of raw material resources is the main reason for such a situation. A considerable amount of edible vegetable oils, glycerine and plant types of raw materials are used for the production of paints and varnishes. In cooperation with other ministries we are engaged in constant work on the development of synthetic raw materials. Large enterprises for the output of synthetic glycerine and other effective substitutes are being built. In 1980 and during the 11th Five-Year Plan we envisage an increase in the production of varnish and paint materials and thereby we will reduce their shortage.

With regard to wallpaper glues, the customer demand for them is growing constantly. Chemists take this into consideration. In 1980, as compared with 1975, the production of glues will almost double and by 1985 their output will increase even more. New latex glues are also being developed. They are more convenient in use and much cheaper than those manufactured today.

"It is no secret to anyone that in stores it is difficult to buy photographic color paper, films and chemicals for processing them. What causes this shortage and is anything being done to increase the output of these goods?"

B. Alikin,  
amateur photographer  
Orel, Permskaya Oblast

In 1980 we plan to increase the deliveries of photographic films to trade by 1,200,000 linear meters, of amateur motion picture films, by 400,000 linear meters and of black and white photographic paper, by 2.5 million square meters. We will produce much more photographic color paper and many more developers and fixers. Thus, the supply of motion picture and photographic goods for the population will improve.

Nevertheless, in 1980 it will not yet be possible to fully meet the need for motion picture films, photographic color paper and chemicals for processing them. However, for the 11th Five-Year Plan we envisage a big program for fully meeting the demand for these goods. Cooperation with GDR chemists within the framework of the international economic organization ASSOFOTO will also help us in this. In particular, expanded deliveries of amateur color motion picture films are envisaged.

At present our institutes develop films in which, without a decrease in the magnitude of resolving power, light sensitivity doubles. In 1980 a mass output of films in cassettes will begin and their production in rolls



and bobbins will be greatly reduced. The production of new types of photographic paper vignettted with polyethylene will begin in 1981. At the same time, we are planning the output of photographic fabric and then black and white photographic paper on a base tinted with red, blue, green and other colors.

In connection with the subject touched upon I would like to note the following. In our opinion, in order to service amateur movie makers and photographers more effectively, there is an urgent need to establish large firm centers for processing color films and photographic color printing fitted with modern, highly productive automatic equipment, which will make it possible to lower the cost of processing and the expenditure of materials. Two such experimental centers are to be established in Moscow and Kiev.

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## BYPRODUCT GAS PRODUCTION IN NIZHNEVARTOVSK DISCUSSED

Moscow PRAVDA in Russian 24 Nov 79 p 1

[Article by S. Vtorushin, PRAVDA correspondent, Nizhnevartovsk, Tyumen-skaya Oblast: "On Byproduct Gas"]

[Text] The technological column of the first plant for the processing of byproduct natural gas rose over the taiga next to Nizhnevartovsk 5 years ago. Soon the enterprise turned out a product—dry gas and so-called wide fraction, or unstable gasoline. Millions of cubic meters of blue fuel are now sent through the trans-Siberian gas pipeline every day from Nizhnevartovsk to the Kuznetsk Basin and Surgut. Gasoline is sent by railroad to the country's petrochemical enterprises.

The capital of Samotlod has become the largest center of byproduct gas processing. Three technological stages operate on one site. In fact, each of them is an independent plant. The fourth stage is in the process of commissioning. Their total annual capacity will be 8 billion cubic meters of fuel. The domestic petroleum industry has not yet had such an inspiring complex.

"The most improved flow sheet for the processing of raw materials is used at our enterprise, which is fitted with the most modern Soviet equipment," said V. Tatarenko, director of the Nizhnevartovsk Gas Processing Plant.

"The most complete extraction of liquid hydrocarbons from gas is carried out here."

Last year Siberian workers marked the output of 1 million tons of unstable gasoline. The Komsomol youth shift headed by V. Komarov had this honor. It is remarkable that the plant personnel was able, after the commissioning, to put all the three technological stages into operation at the designed capacity. According to the standards 9 months are allocated for the mastering of each of them.

Gas processing is a new industrial sector in West Siberia. Specialists, who arrived from the country's other regions, put the first stage of the Nizhnevartovsk Plant into operation. Now they are trained locally. This is

helped by tutorship. As a rule, the most experienced people are sent to new production, where the industrial process has not yet been adjusted. For example, senior operator B. Merkulov and shift head B. Strel'nikov worked at all the three stages of the plant and helped many new workers to master the complex production.

Of course, the personnel have their difficulties. However, even in the most complex situations they try to find a way out. For example, let us take the same shipment of wide fraction of byproduct natural gas. Until recently it was hampered by the constant shortage of tank cars. Gas processors found a way to evolve stable gasoline, which they began to pump into a pipeline and send through an underground main line for further processing. This makes it possible to annually preserve hundreds of thousands of tons of valuable raw materials for the national economy and to free part of the rolling stock for the transportation of unstable gasoline.

Creative search is characteristic of the young collective. Enterprise specialists were able, without the modernization of production, to increase processing capacities by 1 billion cubic meters. Owing to this gas losses were lowered considerably and consumers obtained additional fuel. The output of liquefied gas was also set up. Before that it had to be delivered to the Central Ob' area.

Preparatory work on putting the fourth stage into operation is now being done at the enterprise.

The geography of gas processing is expanding. The First Belozersk Plant will be put into operation by the end of this year. The second plant is being built next to it. It will turn out output the following year. A large Surgut plant will be put into operation together with it. It was decided to also build a gas processing enterprise in the region of the settlement of Lokosovo. More than 80 percent of all byproduct gas is to be utilized at Siberian petroleum deposits by the end of the five-year plan. The accumulated experience will help us to reach this. From the beginning of the year Nizhnevartovsk sent 127 million cubic meters of gas in excess of the plan to industrial enterprises.

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## UNIT FOR PARAFFIN EXTRACTION PUT INTO OPERATION IN NOVOKUYBYSHEVSK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Nov 79 p 1

[Article by A. Vorob'yev, Novokuybyshevsk: "At the Designed Capacity"]

[Text] Parex is a new industrial unit of the Novokuybyshevsk Petroleum Refining Plant. This name simply stands for paraffin extraction. This operation is modest, but very necessary for the country and for our industry.

"This facility is unique," explains Yu. Shevelev, chief process engineer at the Kuybyshevnefteorgsintez Association. "A new industrial process for the production of normal paraffin from petroleum is used here for the first time in the Soviet industry."

Normal paraffin is the initial raw material for the production of sulfol, the basic component of most synthetic detergents. On the basis of this paraffin microbiologists also prepare protein and vitamin additives to fodder for livestock. Both products are now scarce. The thousands of tons that Parex will produce annually represent a good addition to the general balance.

The unit reached the designed capacity almost three times as fast as the standard period. This is the result of cooperation between our country and the German Democratic Republic. Almost the entire set of equipment was manufactured at the Karl Liebknecht Machine Building Plant in the city of Magdeburg.

The unit has an efficient external appearance. It is an intricate set of bright multicolored pipes, whose total length is 150 km. It looks like the nozzles of a space rocket and gas burners of a giant heating furnace. It has silvery capacities, reservoirs and columns...

How does the new technology differ from the old one? V. Semenov, chief of the catalytic gas production, answered this question:



"Productivity, as compared with the traditional technology of carbamide deparaffinization, doubles. The consumption of electric power decreases significantly and such expensive reagents as carbamide, isopropyl alcohol and other scarce chemicals are not needed."

"There is another plus," adds I. Gimranov, chief of the unit. "We are also producing a 'byproduct'—higher-grade diesel fuel. Its freezing temperature is -60 degrees. Members of polar expeditions and northerners greatly need such fuel."

I remember a hot August day when the first paraffin—a bottle of whitish liquid—was obtained at the unit. On the eve of the anniversary of October the following entry appeared in the log: "The designed capacity exists."

Late in the evening a whole sea of fire swayed over the huge industrial site: Holiday lights joined work lights.  
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## WIDE USE OF ELECTROCHEMICAL METHODS IN NATIONAL ECONOMY URGED

Moscow IZVESTIYA in Russian 25 Dec 79 p 3

[Article by Ya. Kolotyarkin, academician, and V. Smirnov, RSFSR honored man of science and technology, doctor of technical sciences: "The Path to New Techniques"]

[Text] A careful attitude toward nature, overall utilization of raw materials, reduction in the expenditure of materials and power resources and development of waste-free industrial techniques are the integral features of the socialist method of national economic management. The draft law on the protection of the atmospheric air published in the press for a nationwide discussion once again attests to this.

Apparently, an extensive utilization of electrochemical methods should become one of the basic trends in the area of development of fundamentally new waste-free techniques. Electrochemistry unifies two big trends. Conducting chemical reactions under the effect of an electric current is the first and obtaining electric power through chemical reactions, the second. The possibility of directed processes both in electrochemical transformations of substances and in the production of electric power will make it possible, in practice, to eliminate the dissipation of energy into the environment.

Electrochemical methods are being introduced ever more widely into chemical industries and power engineering. Here it is appropriate to recall the sagacious words of Vladimir Il'ich Lenin: "We must have a new technical base for the new economic construction. Electricity is this new technical base. We will have to build everything on this base."

The synthesis of inorganic and organic substances, including the strongest oxidants, creation of new current sources, fuel elements and power consuming storage batteries and rapid development of electrochemical production and electrochemical dimensional working of metal and of methods of protecting metal against corrosion--this is by no means the complete list of the present application of electrochemistry. More than 25 million tons of chlorine, approximately the same amount of caustic soda, all

fluorine, millions tons of aluminum, zinc, lead and many other items are now annually produced all over the world by electrochemical methods. The total capacity of presently produced chemical current sources is not second to the capacity of existing electric power stations.

Nevertheless, owing to the noted features, electrochemistry must be much more widely enlisted in the solution of many ecological problems. In practice, all the world's outstanding electrochemists arrived at this idea in the last few years. What can electrochemistry give for the preservation of the planet's ecological balance?

In industrial and transport power engineering the chemical energy of petroleum, natural gas, coal and shale is now transformed through combustion reactions into thermal energy and only later is it converted into other forms of energy. Metallurgy consumes vast amounts of organic fuel.

When fuel is burned, the earth's atmosphere is depleted of oxygen and enriched with carbon dioxide, which is the largest-tonnage waste of industry.

Our country has adopted the policy of a rapid development of atomic power engineering. This will make it possible to preserve coal containing raw materials now used as fuel for the needs of the chemical industry and to reduce the consumption of oxygen in the atmosphere and its pollution with carbon and sulfur dioxide, as well as with the compounds of selenium, arsenic, tellurium, mercury and other elements now entering the atmosphere with gas and dust discharges of thermal electric power stations. It is to be hoped that with the development of atomic power engineering and, especially, with the mastering of thermonuclear synthesis, electric power will become the only type of energy not polluting the atmosphere. This will open up the widest field of activity in the development of advanced electrochemical techniques.

The capabilities of hydrogen power engineering are widely discussed in the present scientific literature. With the availability of cheap atomic energy it will be possible to obtain this gas in a sufficient amount by means of an electrolytic decomposition of water.

The utilization of hydrogen as a reducing agent instead of coke in metallurgical processes will make it possible to transfer these processes to a direct reduction of metals from ores. This is especially promising for the production of iron in the form of powder free of impurities entering iron with coke and lowering the quality of steel, mainly of phosphorus and carbon. As a result, the quality of steel and the durability of articles produced from it will improve sharply.

At a number of the country's chemical enterprises obtaining chlorine and other products by electrolysis at present hydrogen is not utilized and is discharged into the atmosphere. Apparently, in the very near future it

will be advisable to establish experimental units for the direct production of iron powder, similarly to the production at the metallurgical plant in Staryy Oskol, but with ore reduction with electrolytic hydrogen, which is the waste of chemical enterprises.

The transfer of metallurgical processes and transport now operating on coal containing fuel to hydrogen has a very important advantage. During an ordinary combustion of hydrogen or its combustion in a fuel element, as well as during ore reduction, water is formed and as much oxygen is consumed for the combustion process as is formed during an electrolytic decomposition of water into hydrogen and oxygen. Thus, neither will the atmosphere be depleted of oxygen, nor will carbon dioxide accumulate in it during the occurrence of such industrial processes. As a result of the direct electrochemical reduction of iron from ore the atmosphere will be even enriched with oxygen liberated at the anode.

Scientists are now engaged in a search for electrochemical ways of processing carbon and sulfur dioxide into valuable chemical products. Apparently, subsequently the electrochemical reduction of carbon dioxide obtained from the atmosphere will be one of the important methods of synthesizing organic substances.

The production of useful resources forces us to resort to the utilization of less and less rich metal deposits and of secondary metal often very dissipated in waste or occurring in the form of alloys. Electrolysis, in which it is possible to systematically isolate at first less and then more active metals, is one of the most promising methods of separating metals.

Water possesses a unique dissolving power. Therefore, vast reserves of minerals are concentrated in seas and oceans. They can be concentrated, at the same time obtaining desalted water, and processed by electrochemical methods. In particular, very efficient, new electrochemical processes of obtaining chlorine and caustic from sea water have already been proposed.

Apparently, in the very near future electrolysis will be the basic method of cleaning and decontaminating sewage from a number of organic and inorganic toxic compounds, especially phenols and cyanides. Electroflotation and electrocoagulation are right now successfully used at numerous industrial enterprises either as independent methods of cleaning water, or in the form of individual stages in overall drainage cleaning. To be sure, the development of powerful and highly efficient hydrogen and oxygen fuel elements, during the operation of which water is formed simultaneously with electric energy, will be of great importance for obtaining pure water.

If in the first half of the 20th century we had to put up with the dissipation of a number of valuable chemical elements, for tomorrow's



industrial scale this becomes completely inadmissible. For example, when tetraethyl lead is added to motor fuel to increase its octane number, in practice, there is an irrevocable dissipation of lead, which, in addition, has a destructive effect on all living things. The utilization of zinc for current sources and for the zinc plating of tin, in practice, irrevocably dissipates zinc, of which not so much remains in the earth's crust, and so forth. That is why the work on the development of new current sources and fuel elements without the use of catalysts from the metals of the platinum group, work on the development of electric cars and transition to new protective coatings based on polymeric materials are so important.

The capabilities of electrochemistry are also exceptionally great here. Electrophoresis is one of the most advanced methods of applying protective polymeric coatings. In the Soviet Union, the United States, Japan and the FRG it is widely used in motor vehicle building and other industrial sectors. However, this method has a significant shortcoming. After the application of the first layer the surface of the coated article does not conduct electricity, owing to which it is no longer possible to apply the second layer by the electrophoretic method. Therefore, as a rule, the above-mentioned method is used only for priming. A method of obtaining electrically conductive primers has been developed in our country recently. A second layer can be applied by the same method to the prime coat obtained by this method even without preliminary drying. Such a double-layer system of coatings makes it possible to increase the protective properties of coatings and the efficiency and safety of work, to fully automate painting and to eliminate the harmful discharge into the atmosphere.

The use of such methods, protection of metals against corrosion by means of inhibitors and cathode and anode passivation of metals can greatly diminish the damage done by corrosion to the national economy.

As is well known, many biochemical processes are noted for a high efficiency. Such important aspects of vital activity as metabolism, generation and spread of the neural impulse, perception of a visual image and contraction of cardiac muscles are connected with electrochemistry. The investigations of these processes and creation of their analogs in industry can lead to highly effective, new methods of obtaining a number of organic substances and energy. The words of the outstanding British scientist M. Faraday should be mentioned here: "No matter how miraculous the laws and phenomena of electricity revealed to us in the world of the inorganic or dead substance may be, the interest they evoke can hardly be compared with what is inherent in the same force in combination with the nervous system and life."

Subsequently, electrochemical methods will be utilized widely and, apparently, without any serious competition for the conversion of solar energy into electric energy. This will be of exceptionally great importance for the preservation of the ecological balance on earth.

The combination of all the available data convincingly shows that, despite the great mass and apparent inertia of our planet, earth, as a thermodynamic force, is in an extremely unstable equilibrium. This equilibrium, this harmonious combination of physical, chemical and biological processes, which contributed to an active flourishing of life on earth, to the appearance and improvement of mankind and to its amazing progress, must be preserved very carefully and skillfully. The decisions of the 25th CPSU Congress and the new constitution of our state direct us toward this.

[89-11439]

11,439

CSO: 1841

## PRODUCTION OF SALT FROM POTASSIUM INDUSTRY WASTE URGED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Dec 79 p 2

[Article by Ye. Leont'yeva, Solikamsk-Soligorsk: "Salt Piles"]

[Text] Salt has been a key product during all ages and times. On Slavic land the gift of bread and salt meant a wish of health and happiness. Salt helps to pickle metals, to marinate cucumbers, to dress leather, to store meat and to make glass, rubber and paper. Salt forms part of herbicides and fertilizers. It is believed that there are no less than 14,000 methods of utilizing it. Perhaps no other mineral is used so widely. However, only a small amount of salt—about 5 percent of the world output—reaches the dinner table. The industry absorbs the rest.

Now, when by means of technical facilities man has a wide access to salt deposits, salt still remains scarce. Economists estimate that now its shortage amounts to 2 million tons. One will agree that with an annual output of 16 million this is not so little.

The cities of Soligorsk and Solikamsk owe their origin to the large deposits of potassium salt in Belorussia and the Urals. Vast piles of the waste of industrial production of potassium fertilizers have appeared next to these cities. The dark ash mounds have become an inseparable part of the landscape there. Where are they from?

Breaking through the thickness of earth (clay, gypsum or flagstone) at a depth of  $\frac{1}{2}$  km, miners lower large-tonnage equipment down the shaft in order to mine sunstone--sylvinite. Only one-third of the output finds a useful application—it is used for topdressing fields. The remaining part, 90 percent of which consists of sodium chloride, that is, common salt, forms the dead mounds.

Of course, there is no benefit from them, only harm. Waste pollutes the air with dust and salinizes soil and air. During the 14 years of exploitation of the Soligorsk potassium basin, which is located in the very heart of Belorussian Poles'ye, more than 120 million tons have accumulated

there. The dumps occupy about 500 hectares of fertile land. If the waste of Uralkaliy is added to that of Beloruskaliy, the figure will have to be doubled.

A legitimate question arises: With such a large salt shortage does the idea of utilization of waste not occur to anyone? In general, it does. Scientists waged an attack against salt piles on a wide front. A scientific council entrusted with the coordination of the research of 15 scientific research organizations in this field was established at the Belorussian SSR Academy of Sciences.

However, not all of them obtained concrete results. It is true that there are also a number of cardinal proposals.

For example, the Institute of General and Inorganic Chemistry of the Belorussian SSR Academy of Sciences, the Institute of Livestock Breeding of the republic's Ministry of Agriculture and the specialists of Beloruskaliy developed a method of obtaining fodder salt for livestock breeding from waste. They also suggest the use of waste as concrete fillers and for the production of various building materials and its application to soil to improve its structure. However, almost all this did not go beyond laboratory experiments.

Meanwhile, a useful application can be found for the salt piles that have become an eyesore. By enriching waste in a very simple way it is possible to obtain industrial, fodder and table salt.

What will this give from the economic point of view? A great deal. After all, where industrial salt can be used, common salt is now utilized. But it is five times as expensive as the salt that can be obtained from waste. Transport costs are another item. Please compare: The expenditures on the delivery of 1 ton of common salt from the Artemsol' Association to the capital of Belorussia are 8 rubles. The cost of enriching the waste of Beloruskaliy is 2.7 rubles per ton. When table salt from Baskunchak is transported with numerous transshipments to petroleum and gas industry workers in Tyumen' and Yakutia, up to 200,000 tons are lost on the road annually. Often salt is transported at a distance of 2,000 km. Who will say that this is advisable?

What do the people at the sector's headquarters--the Ministry of Chemical Industry, to which Belorussian and Ural salt piles belong--think about this?

To the question as to whether chemists intend to increase the production of salt from waste, V. Zykov, chief of the Soyuzkaliy Association, said without thinking:



"Why to increase it? We do not have enough railroad cars for the delivery of potassium fertilizers, let alone for salt. Moreover, this product is not basic for us..."

The answer does not need any explanations. Yet Soyuzkaliy enterprises have the capacities for waste processing. Uralkaliy alone could produce 1,200,000 tons of purified salt. However, these production facilities by no means operate at a full capacity—at times they operate at less than one-half the capacity. Therefore, last year salt losses totaled 2.5 million rubles in Uralkaliy. The situation is not better this year.

"Together potassium industry workers could now produce about 2 million tons of salt," P. Saprykin, chief of the Main Administration of Salt Industry of the USSR Ministry of Food Industry, expressed his opinion.

"This would cover all our shortage. But, alas, they do not meet us halfway. Because of this we are forced to work under a great strain, some salt mines are exploited to the point of depletion and sometimes the equipment repair schedule is not met."

Food industry workers often submitted their proposals for the use of the waste of the potassium industry to the USSR State Planning Committee and the Ministry of Chemical Industry. There was a correspondence at the level of deputy ministers. Unfortunately, however, it did not produce practical results. In fact, there was a futile exchange of letters.

"I don't understand what is the matter," P. Saprykin shrugged his shoulders. "We are doing everything that depends on us."

The matter lies in the notorious departmental disconnection, which often has been a barrier on the path of solution of by no means the most complex problems. As long as food industry workers were the main salt consumers, they did not object to the fact that the Main Administration of Salt Industry was in their department. But now they object: "Why do we need the complex mining sector? We have our own troubles." The present role of chemists, who are the main salt consumers, suits them fully: obtaining a ready fertilizer instead of producing it. Moreover, the USSR State Planning Committee does not plan an overall processing of the waste of the potassium industry for enterprises. Hence the lack of interest in this.

The matter urgently requires a unified scientific and technical policy. After all, it is not a matter of intersectorial misunderstandings of individual problems, but of an overall utilization of the resources of the country's most important economic regions, environmental protection and prevention of the removal of salt to the main water arteries of the country's European part—the Volga and Dnepr. Pitiful half measures, such as putting dumps underground, must not be used any longer.

The people have a saying: "To scatter salt is to court disaster." Is it not a disaster when millions of rubles of the people's funds accumulated in salt piles become only a dubious decoration of the landscape?

[88-11439]

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CSO: 1841

## CONSTRUCTION OF AMMONIA PRODUCTION UNIT IN CHERKASSY DESCRIBED

Kiev PRAVDA UKRAINY in Russian 13 Nov 79 p 2

[Article by V. Aleksandrov, Cherkassy: "The Cherkassy Standard"]

[Text] At the Cherkassy Azot Association a large tonnage unit for ammonia production turned out the first output. The capacities for the output of mineral fertilizers increased by 450,000 tons. Builders, installation men and chemists fulfilled the socialist obligation--they completed construction and installation work 2 months ahead of schedule.

There is joy on the faces of the participants in construction, whom we meet these days, not only because this unit was commissioned ahead of the planned schedule. For the first time in the country Cherkassy builders and installation men spent less time on the construction of an ammonia complex of such a capacity than envisaged by the standards.

The high level of organization of the construction project was ensured by the selfless labor of workers and by the extensive organizational work of economic managers and party, trade-union and Komsomol organizations. The socialist competition according to the principle of "work relay race," which combined the efforts of allied workers--the client, contractor, subcontractors, supplier enterprises, planners and scientific workers--played an important role. Having become like-minded persons in the fight for an acceleration of construction, the partners observed the contractual obligations, strictly following the slogan of the relay race "from mutual claims to mutual assistance and support."

The improvement in the mechanism of construction management ensured the main gain in the fight against time. The Cherkassy ammonia installation is an intricate complex, in whose construction more than 30 organizations participated. It can be imagined how complicated it would be to manage such a large number of subdivisions in different departments by traditional methods, when tens of thousands of events are included in a single

network schedule, which, owing to its scale, is often not met and all the problems of mutual coordination of the work of allied workers are solved at business and planning meetings.

The Cherkashinstroy Trust and its subcontracting organizations divided the entire site into subcomplexes and autonomously functioning subsystems--units consisting of one or several technologically connected work stages. Each construction and installation unit had its own network schedule. This simplified the management of construction, strengthened the relationships among partners and created the conditions for flow line production.

Almost 39,000 cubic meters of commercial concrete were placed during the below-grade work of the complex over a period of 6 months. Working within the limits of their units, construction and installation administrations widely used low-level economic accountability. The brigades from the Construction and Installation Administration-27 of the Cherkashinstroy Trust of V. Zabolotnyy, winner of the USSR State Prize, hero of socialist labor, deputy of the USSR Supreme Soviet, as well as of V. Beletskiy and I. Kravchenko, built all the foundations for the building and equipment of the unified wing by the method of brigade contract.

The length of start-up and adjustment work is the characteristic feature of chemical units. It is not accidental that the closer the finish, the more workers, especially installation men, are concentrated on construction sites. There is work for everyone, because in the process of the idling and testing of mechanisms planned and unplanned discrepancies are revealed and various constructional defects are detected. It is necessary to eliminate them, to connect and adjust everything everywhere and to make it work. All this is done simultaneously at the entire complex.

The unit method of construction made it possible to maximally combine installation with start-up and adjustment work and to begin the idling of equipment as individual units were ready in an order corresponding to the technique of ammonia production. There was a strict schedule ensuring the top priority readiness and transfer of the machines and installations needed in the first place for adjustment. One after the other the inspected, idled and adjusted apparatus and units were accepted by the client and builders and installation men had nothing to finish.

Heavy vertical apparatus are usually installed by means of installation masts with the use of guy ropes, anchors and other hoisting facilities. This inevitably leads to the blocking up of the site and to a temporary stoppage of work on neighboring units. In Cherkassy the Construction Administration-30 of the Promtekhmontash-2 Trust installed the assembled synthesis column and the absorber with hydraulic lifts.



The hoisting of the reactor-generator, which weighs 400 tons and is 76 meters high, was most complicated. A special 500-ton hydraulic lift was made for its erection. No one doubted its success. The workers of the Planning-Technological Design Institute of the Ukrainian SSR Ministry of Installation and Special Construction Work by means of computers calculated the strength and stability of the reactor-regenerator and checked their conclusions at the department of elasticity of Kiev State University imeni T. G. Shevchenko. For the first time in Soviet practice the brigades of I. Ryl'chenko and A. Kurchi lifted the superheavy silvery structure resembling a rocket entirely with a hydraulic lift.

The main scaffold bridge was installed by the progressive method. This is a complex and one of the most labor intensive units. The arrangement of pipelines with a large number of expansion bends located on horizontal and vertical planes with a transfer from mark to mark at various vertical angles requires vast expenditures of labor. Traditionally, they are assembled after metal structures. Installation was carried out there in a combined way, in tiers. Pipelines were lifted with long--up to 25 meters--ropes made and treated with heat at an installation and set up plant.

Tier assembly greatly simplified technology. Labor intensive operations for "dragging" pipelines to marks with hoists were eliminated. A total of 60 percent of the 2,285 pipe joints were welded under plant conditions. The entire installation of the scaffold bridge, constituting about 17 percent of the volume of construction and installation work in the complex, was performed by two brigades, that is, of Yu. Voloshchenko and A. Moroz.

The Cherkassy experience can and should become the standard for the builders of chemical production facilities. It once again confirmed that improvement in the mechanism of construction management helps to uncover and activate new potentials and to commission capacities ahead of schedule.  
[89-11439]

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CSO: 1841

## NOVOKOKANDSKIY CHEMICAL PLANT CONSTRUCTION WOES DETAILED

Tashkent EKONOMIKA I ZHIZN' in Russian No 8, 1979 pp 40-42

[Article by V. Karadengizov: "Novokokandskiy Chemical Plant to Come"]

[Text] Journalists from EKONOMIKA I ZHIZN' have been frequent guests at the Kokand Superphosphate Plant. A great deal has attracted us at the oldest enterprise of the republic's fertilizer industry. On the one hand there is the selflessness of its toilers, with which from year to year they have reached the highest production figures and have "squeezed out" from old literally patched-up equipment again and again above-quota tons of "granules of fertility," and on the other their creative enthusiasm because of which under existing conditions they have solved the most complicated scientific and technical problems of the industry: They were the first to begin to use Karata phosphorites instead of raw material delivered from far-off Apatity, and they were the first to produce ammonized superphosphate and to introduce drying of it and its granulation.

And the person who has headed this enterprise for almost 40 years and reared this remarkable team, the spirit of all its good deeds, Vladimir Dmitriyevich Bazilev, will always delight us with his inexhaustible energy, youthful fervor and managerial wisdom.

Everytime we visited there and shared our impressions with the plant's workers they told us of an old dream--to have a new plant with advanced technology. This was the dream not only of experienced specialists who had become cramped within the confines of the old production process, but also of people seriously thinking about lofty national economic interests.

The further development of agriculture in the republic is contingent on the creation of new capacities for the production of mineral fertilizers. The construction of a large enterprise in the area of Kokand is convenient from all points of view: This is the area of the most intense cotton growing--the Fergana Valley--and here there is a manpower potential and chemical personnel.

The existing superphosphate plant, in spite of all efforts, is clearly obsolete and its products in terms of biochemical properties are vastly inferior to modern ammophos. Finally, the plant is located at the boundary of a city which is in no way organized from the viewpoint of sanitation and environmental protection.

For many years the chemical workers of Kokand have fought for the realization of their dreams. V.D. Bazilev has kept extensive correspondence with the USSR Ministry of the Chemical Industry and with planning and design organizations. And as early as the beginning of the Ninth Five-Year Plan period it became clear that a new plant was to be. The ministry made its decision in 1970. And in 1972 the Sverdlovsk Uralgiprokhim [Ural State Institute for the Planning of Chemical Plants] Planning Institute developed the basic planning and estimating documentation.

But construction could not begin so soon; it was delayed by the construction of large capacities for the production of similar products in Almalyk and Samarkand. And only now are we witnesses to the beginning of the Novokokandskiy Chemical Plant. Quite possibly the largest in Central Asia.

Construction has begun seven kilometers from Kokand to the left of the city's airport, not too far from Kakir Station. Here the Sokh River, mighty in antiquity, has created thick strata of gravelly alluvia with a depth of up to 30 meters. The soil is unsuitable for agricultural utilization; on the other hand it has no equal for industrial construction. On an area of 33 hectares can already be viewed the outlines of the first, as yet subsidiary, projects of this giant, such as the foundations and frames of two equipment warehouses, an engineering building, a cafeteria, the entrance, cleaning facilities, a garage, etc. Already dug out in the rough is the foundation pit of the building for the production of sulfuric acid, the railway branch line is somewhere at the stage of completion, and the erection of a water conduit and sewerage collector is under way.

By June 1.192 million rubles of work had been done. And the first priority complex--for the production of sulfuric acid--costing 48 million rubles, should go into service by 1982. A start has been made. But it will still take more than a year and a half.

It turned out that, in keeping with the contract, the equipment for the production of sulfuric acid--an SK-38 plant--began to arrive in Kokand from the Polish People's Republic as early as last year; and it was decided to begin erection of the plant in August 1977.

This would have made sense if the construction site had been extensively developed, which ultimately would have drawn closer the time for the installation of the equipment. But the Ministry of the Chemical Industry did not allot sufficient capital investment, and the builders would hardly have had enough manpower to master more.

The plan for this year includes building and installation work to the tune of 2.2 million rubles. But only 352,000 worth was done in five months. Today there is every reason to blame the builders for this. Having created for the purpose of constructing the Novokokandskiy Chemical Plant Building and Installation Administration No 10, the Uzbek SSR Ministry of Construction Pergana Trust No 14 nevertheless assigned to it projects of other of its subdivisions, such as a general school, a dormitory, an arts and crafts school, and an airport building. These projects are deliverable, and, of course, all attention has been directed toward them, and the work on the chemical plant is being done as convenience dictates.

Here is being felt also an acute shortage of material and equipment resources. For example, for the purpose of completing the equipment and materials warehouse it is necessary to build a ceiling and complete the concrete floors. But for the first there are no metal structures and for the second no concrete. There is no concrete also for the imported equipment warehouse, and besides there is also no framework and lumber for the decking; it would be possible to install pillars on the already completed foundations, but Glavstroyindustriya [Main Administration for Industrial Construction] has promised to deliver them only in the third quarter. The crew of TashPI [Tashkent Polytechnical Institute] Final-Year Student Dzhamal Nasyrov has been idle here for a week. The picture is the same at the engineering building, where ground-level operations have paused at the 80-percent level.

This year SMU-10 [Construction and Installation Administration No 10] has received only a tenth of the required framework and of the 3000 cubic meters of precast ferroconcrete earmarked for the chemical plant not a single one has been received. All this appears strange, at least, if one recalls that the USSR Ministry of Construction has allotted all the necessary resources for a special purpose--the Novokokandskiy Chemical Plant. Who is to be asked what has been done with them? The Uzbek SSR Ministry of Construction or its Trust No 14?

Practically only the subcontractors are working more or less steadily: the No 5 section of the Pergana Administration for Mechanization, involved in excavating work, and the Kokand Specialized Self-Supporting Section, whose job is roads, access drives, and the outside-area water line and sewer system. But these subdivisions too look rather pathetic in the face of this vast construction project: The first has at its disposal a total of one excavator and one bulldozer and two wheeled cranes and two tower cranes, and the second is no better off. They have also been experiencing difficulties with support.

"Our situation is grave," complains SMU-10 Boss T.A. Khamrabayev. "The frequent lost time and the low machinery-worker ratio are reflected in labor productivity. In five months the mean output per worker reached only 2.50 rubles. This is very low. Wages are also low accordingly. In K. Nasyrov's crew, which you are already acquainted with, wages in May did



not exceed 100 rubles. People are held only by the prospect of a large construction project."

True, the large construction project in Kokand is still in the future. Someone is to develop it. For next year the client announced a building and installation operation plan to the tune of 8.2 million rubles, and later the amount of building and installation will increase still more and equal on average 20 million to 25 million rubles per year. This cannot be stretched over a single construction administration, and the less so over such a feeble one as SMU-10. The UNR-705 [Work Supervisor's Administration No 705] and PMK-113 [Mobile Mechanized Column No 113] of the same trust hardly will be able to ensure normal construction progress. In addition, it is not possible to involve all contracting organizations in chemical industry projects and completely paralyze construction in Kokand, with a population of many thousands, with the annual capital investment in this construction already nearing 20 million rubles.

The creation of SMU-10 cannot even be called a half-measure, the more so because there is no base of any kind. The section of the building materials combine supplying all the above-named organizations is located at a distance of more than 20 kilometers from the construction site and is in the last stage of collapse. Since 1964 there has been in operation there just a mobile concrete plant with a total capacity of 160 cubic meters per shift and it produces concrete by using globular gravel and unwashed sand. This is why it has been so tight with concrete at the chemical plant's construction site even at the early stage of construction. It will be worse later, since the quality of this concrete is unsuitable for domestic structures.

"There should be a well supplied construction trust in Kokand," is the opinion of Kh.A. Abbaskhanov, leader of the industrial division of the party gorkom. And it is impossible not to agree with him.

How often we talk of the fundamental observance of standard construction deadlines, and about the considerable losses which the national economy suffers by stretching them out. But here one more large construction project has begun in the republic, and right away lagging behind has begun, and the prerequisites for its tardy completion. They have begun because builders (for many times now!) have turned out to be unprepared.

Of course, in Uzbekistan, in Almalyk, in particular, a great deal of know-how has been gained in the high-speed construction of enterprises similar to the Novokokandskiy Chemical Plant. But one should not place one's hopes too strongly on this, since in Kokand there are no organizations like the Almalyksvinetsstroy [expansion unknown] Trust and the Samarkandkhimstroy [expansion unknown] Association. It seems to us that one should not put one's trust in the assistance of the experimental Fergana Trust No 8 when it completes construction of production capacities for cellulose acetate. Firstly, Fergana is far away and, secondly, this assistance can prove to be belated.

Let us repeat again: It is necessary to create a large well supplied construction trust for the construction of the Novokokandskiy Chemical Plant, intended to last 10 years (total), and for the city of Kokand.

There have also been not a few complaints against the client's service. Financing was found after a delay, and there has been no precision in the putting together of planning and estimating documentation for the construction of later projects of the priority complex and of underground facilities. However there is still no precise address to which to send these complaints.

Not too long ago the decision was made to create a directorate for the enterprise under construction and to transfer to it the functions of the client, which functions the management of the superphosphate plant has performed up to this time. The new directorate is clearly still too weak and has not been outfitted with experienced personnel.

But the main thing has been done: The construction of the Novokokandskiy Chemical Plant has begun. We will follow its progress. We will hope that all the obstacles at the start will be overcome.

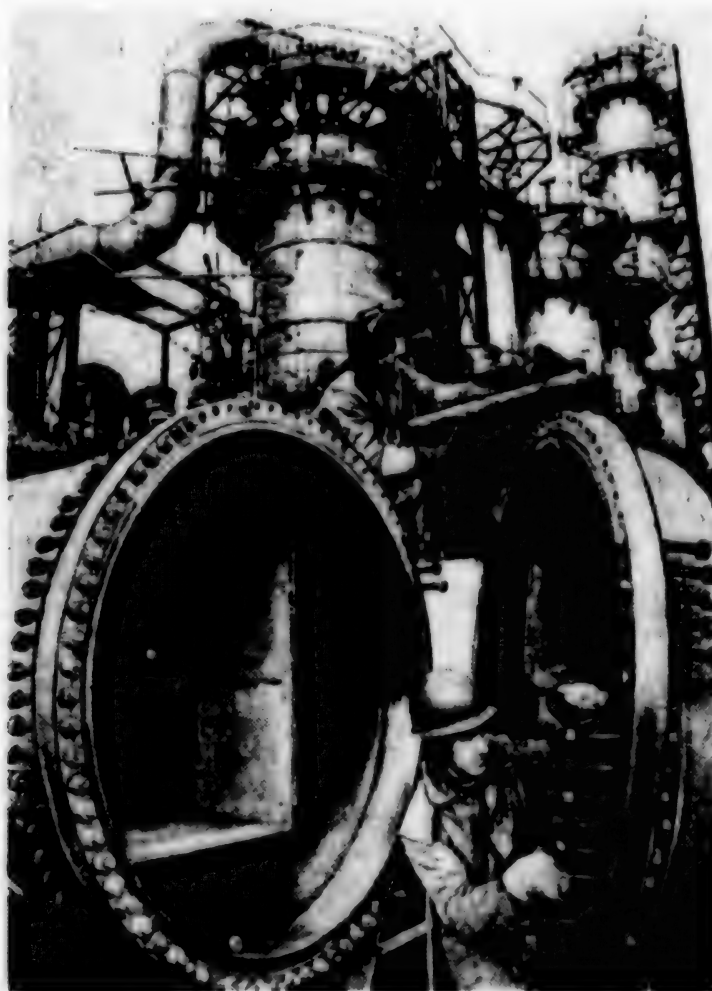
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ETHYLENE OXIDE PLANT UNDER CONSTRUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Nov 79 p 1

[Photo and excerpts from article]



[Excerpt] A plant for the production of ethylene oxide, an intermediate needed for the production of Lavsan, is being assembled by the production association "Nizhnekamskneftekhim" in the Tatar Republic. The builders are striving to fulfill their obligation and put the plant on stream by the end of this current year.

[64-P]

CSO: 1841

# AMMONIA PLANT UNDER CONSTRUCTION

Moscow SEL'SKAYA ZHIZN' in Russian 20 Nov 79 p 1

[Photo and caption: "Facilities Growing"]

[Text] The Rustav Chemical Plant in Georgia is undergoing a second childhood. The enterprise is being rebuilt, its shops becoming modernized, and new production facilities being added.



[Caption: Ammonia production complex being raised.]  
[63-P]

CSO: 1841



## LIQUID CHLORINE PRODUCTION FACILITY WINS PRIZE

Moscow EKONOMICHESKAYA GAZETA in Russian No 46, Nov 79 p 17

[Text] The design and construction of the liquid chlorine and caustic soda production complex, erected by the "Pervomayskhhimstroy" Chemical Construction Trust at the Pervomaysk Chemical Plant in Khar'kovskaya Oblast, won the USSR Council of Ministers Prize for 1979.

Electrolyzers with metal oxide instead of graphite anodes were used. This raised the purity of the products of electrolysis, reduced equipment down time and cut electricenergy consumption by 10 percent. The installation of large technological equipment in open areas and on shelves proved to be highly effective.



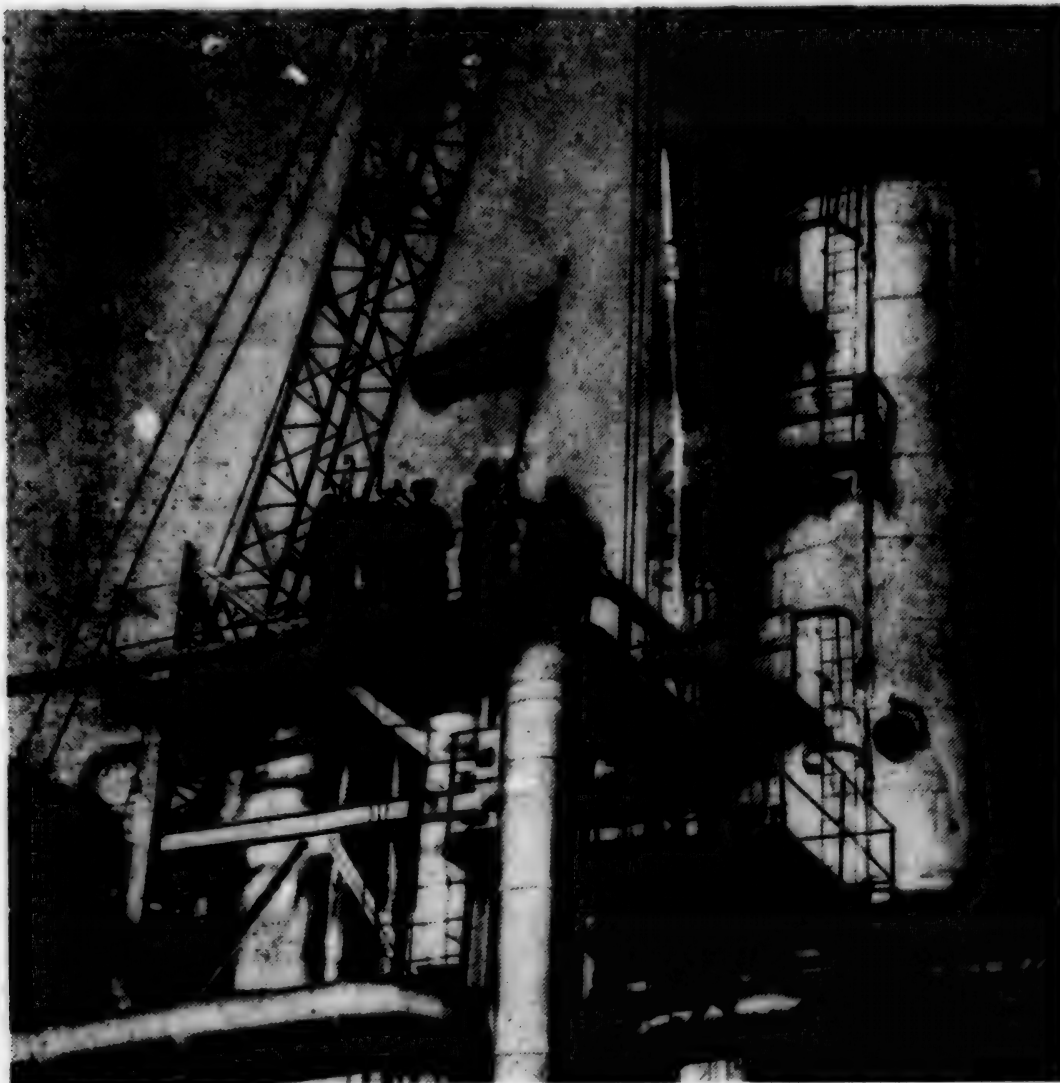
Construction of the complex was completed 9.5 months ahead of the normal schedule. Actual cost was 820,000 rubles less than estimated cost.

[97-P]

## LARGE AMMONIA PLANT CONSTRUCTION UNDERWAY

Moscow PRAVDA in Russian 4 Oct 79 p 1

[Excerpt] Construction of a large plant for the production of ammonia is underway in Kuybyshevskaya Oblast. The designed annual capacity of its first stage is 1.8 million tons. The construction of the second stage of the enterprise is in full swing. The completion of construction of the third stage is targeted for 7 November 1980.



The picture shows a multiple-skills work crew that won in socialist labor competition.

[97-P]

## FERTILIZER AND CAPROLACTAM PRODUCTION FACILITY BUILT

Moscow PRAVDA in Russian 20 Jan 80 p 1

[Excerpt] Start-up adjustment work has begun at the Chirchik "Elektrokhim-mash" Electrochemical Association on a facility for the production of caprolactam, a valuable chemical raw material used in the manufacture of synthetic fiber, all kinds of film and plastics. The national economy will receive 80,000 tons of caprolactam annually. More than 300,000 tons of ammonium sulfate will also be produced here for use in agriculture.



The picture shows supervisory personnel checking equipment before start-up of the water purification installation.

[97-P]

USSR

UDC [661.7:547.295].002.237

PRODUCTION OF SYNTHETIC FATTY ACIDS WITH ADDED HEAT TREATMENT OF THE OXIDATION PRODUCT

Moscow KHIMICHESKAYA PROMYSHELNNOST' in Russian No 12, Dec 79 pp 718-720

DROZDOV, A. S., DIDENKO, Z. V., DEYNIKINA, N. I., POTATUYEV, A. A. and MIRONOV, YU. A.

[Abstract] Heat treatment of oxidized paraffin has been shown to improve its quality and to reduce the consumption of sodium sulfate as well as of sulfuric acid and by-products in the production of fatty acids. This is done in the liquid phase at 320°C under a pressure of 30 kgf/cm<sup>2</sup> with 2-5% water present. An experiment with a 2-ton sample from the Volgodonskiy Chemical Plant was made using 10-20% water at the same temperature but under a much higher pressure of 95-100 kgf/cm<sup>2</sup>. Examination of the oxidized paraffin by capillary gas chromatography and analysis of the fatty acids along with the nonsaponifiables subsequently produced from it indicate that inclusion of such a heat treatment in the process does, indeed, yield a better product more economically. A capital investment of 1,236 thousand rubles for this will reduce the cost of producing fatty acids by 12 rubles/ton and will save the plant 1,190 thousand rubles a year for scarce materials. Figures 1; tables 3; references 3 Russian.  
[92-2415]

USSR

UDC 66.048.28:661.53

COMBINED OPERATION OF STEAM CONDENSERS IN AN AMMONIA SYNTHESIZING PLANT OF HIGH UNIT CAPACITY

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 12, Dec 79 pp 732-735

KRYUKOV, N. P., OGLADKOV, YU. I., SOBOLEV, M. A. and KHARAKH, V. A.

[Abstract] Ammonia is synthesized at the imported Nevinnomysskiy "Azot" Plant at a rate of 1360 tons/day, with the steam from turbines collected and condensed in air coolers. The four air-cooled "GEA" steam condensers, operate in a compression system which handles not only steam but also air, natural gas, nitrogen-hydrogen, and ammonia, with inert incompressible impurity gases being ejected from the system. According to an analysis of thermodynamic and aerodynamic performance characteristics, combining the exhaust collectors behind all turbines will result in a stable normal operation of the condensers at atmospheric temperatures up to 25.6°C and will

extend such an operation by several hundred hours a year, thus shortening the duty of the humidifiers and reducing the consumption of demineralized water. With this arrangement individual condensers cut in as the condensate pressure rises and the system, furthermore, is more reliable during atmospheric temperature drops even to below 18-19°C. The additional piping needed for such an interconnection should be adequately large in cross section (at least 300-350 mm in diameter). Figures 3; tables 2.  
[92-2415]

USSR

UDC 661.522:658.562

#### CONSIDERATIONS CONCERNING THE TECHNICAL POLICY OF AMMONIUM SULFATE PRODUCTION

Moscow KOKS I KHIMIYA in Russian No 12, 1979 pp 21-23

STETSENKO, YE. YA., Koksokhimstantsiya

[Abstract] Soviet by-product coke industry at present employs two methods for the production of ammonium sulfate: with and without saturators. Sufficient experience has now been gained to assess both these methods. The production cost of the ammonium sulfate (AS) obtained in saturator-free facilities is higher, chiefly owing to the substantial steam consumption; even though the product is of granulometrically better quality, it still does not satisfy the quality requirements since its content of crystals in the >0.25 mm class usually is 92-94%, owing to the absence of separation of crystals by size. In general, if ammonium sulfate satisfying the requirements of agriculture is to be produced, the traditional Soviet technology of its production must be markedly revised and modernized. Moreover, the production of ammonium sulfate at by-product coke plants is generally unprofitable owing to the artificially low prices fixed for it, since its 24% sulfur content is considered ballast, although in reality that sulfur is also needed by crops such as tobacco, rice, tea, millet, etc. Major expenditures are needed to streamline the efficiency of the saturator process, but their expediency is dubious so long as satisfactory technical solutions still are not developed. In the Soviet Union, with its diversity of soils and climates and crops, it would be expedient to granulate ammonium sulfate together with other fertilizers, i.e., to produce complex fertilizers. Reducing the maximum size of the ammonium sulfate crystals is, in this connection, a major technical problem.

[78-1386]



## WAYS OF IMPROVING THE QUALITY OF AMMONIUM SULFIDE USED IN THE PRODUCTION OF THIOUREA

Moscow KOKS I KHIMIYA in Russian No 12, 1979 pp 25-27

SEVOST'YANOV, V. N., KHALAIMOVA, A. M., GRIGORASH, A. S., BEZVERKHIY, V. I. and ZHURAVLEVA, V. L., Donetsk By-Product Coke Plant

[Abstract] The possibilities of obtaining grade-1 ammonium sulfide (AS) at the Donetsk By-Product Coke Plant were investigated. It was found that the gaseous hydrogen sulfide from the desulfurization shop, used to saturate ammonia liquor in the production of AS was polluted with hydrocyanic acid (~2 vol.%) and organic compounds (naphthalene, phenol, oils, etc.). All these impurities lower the quality of AS and reduce to 50-70% the yield of thiourea. Inasmuch as the content of the main constituent is 2-3 times as high as the required concentration for thiourea synthesis (160-180 g/liter), it was decided to produce a more concentrated AS, since then the impurities would also be more concentrated and thus easier to remove. Further, since AS tends to color yellow to dark-brown owing to the formation of polysulfide sulfur contributing to a higher thiourea yield, this property of AS was utilized as a criterion for normal thiourea yield. Other measures applied to improve the quality of AS were: a longer storage time, tightened criterions for testing organic matter residues, and better sealing of equipment. All these measures resulted in the production of AS of a quality suitable for thiourea synthesis. Further measures are needed to optimize the quality of AS, since the thiourea synthesized from it is used to manufacture medicines and thus should be highly pure. One of these measures, already introduced at the plant, is the use of the separation-process apparatus for cleaning hydrogen sulfide--apparatus normally used in the gas industry.

[78-1386]

USSR

## ROADBLOCKS TO THE ORE

Alma-Ate NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 10, Oct 79 pp 35-41

NAUMOV, V.

[Abstract] Causes for the failure of the "Karatau" production combine to meet the Five-Year Plan program of supply of phosphorite ore to chemical industrial enterprises are examined. The most important reason is that there has been a systematic failure--not Karatau's fault alone--to fulfill plans for capital construction. The "Karatauphosphorstroy" building trust, which had been fulfilling its Plan responsibilities, was reorganized--at the beginning of the present Plan--into two trusts, "Karataukhimpstroy" in Zhanatas city and "Karatauphosphorstroy" in Karatau. The "Karatau" production combine is one of their clients. But, the trusts have not delivered up to Plan--in industrial capacity, production buildings, housing or social-cultural units. Recourse to another, wood-processing, construction trusts, the "Dzhambulstroy" was not helpful because items from it were supplied on an irregular basis; problems also arose on recourse to the Glavyugstroy, the Glavtsentstroy and the Glavpavlodarstroy, associated with the Ministry of Heavy Construction of the republic. Grievances appear to be widespread. The claim is made that Zhanatas does not attract workers but the city is described as having good housing, water supply heat, sewage and, in planning, electricity and gas; it has young people who want to do a good job. Available housing is inadequately furnished. Absence of social-cultural units, in addition to lack of good housing also contributes to slow exploitation of the ore. Bulldozers (from the Chelyabinsk tractor plant) dumptrucks, parts and motors are in short supply. Trained mechanics are scarce. Sections of the Karatau combine are separated (in Karatau, Zhanatas, repair units, etc) from each other by 100 kilometers; the general director A. I. Shein has suggested a need for restructuring the management, granting independent decision-making authority to the separated units. The telephone system at present, has only 500 numbers, and has to be expanded. Despite shortfalls in the Plan, by other trusts, in order to get more ore from the Karatau combine itself, its subunits must be furnished technical equipment, a steady supply of parts, improved management and repair, qualified key personnel and, above all, construction of units essential for production, housing and the well-being of the workers. Production has to increase two-fold. No references.

[81-8586]

## REFRIGERATION STATION WITH TATKA-545/345 TURBOCOMPRESSOR AGGREGATES OF A HEAVY-TONNAGE TECHNOLOGICAL LINE OF AMMONIA PRODUCTION

Moscow KHIMICHESKAYA I NEFTYANDYE MASHINOSTRANENIYE in Russian No 12, Dec 77 pp 7-9

POPOV, A. YE., KANYSHEVA, T. YE. and USYSKIN, A. D.

[Abstract] The need to increase mineral fertilizer output has necessitated the development and placing onstream of heavy-tonnage ammonia production aggregates. The Ionavskiy nitrogen fertilizer plant and the Kuybyshev nitrogen-manure plant were the first to be designed for 1360 t/day capacities with isothermic storehouses. The design of the lines was developed by the State Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis and installed by enterprises of the Ministry of Chemical and Petroleum Machine Construction. Refrigeration units for the lines were developed by the VNIKhodmash [All-Union Scientific Research Institute of Refrigeration Machines] and the "Tekhnergokhimprom" NPO [technical power chemical industry company]. The refrigeration unit utilizes a special TATKA-545/345 aggregate [TATKA is the abbreviation for the Russian words, three-isothermic ammonia turbocompressor aggregate]. The parameters of the aggregate are listed and a picture of the aggregate is shown. The temperatures provided are -33.8, -12 and +13. The aggregate which has an STMP-4000 electric motor, has adapted, with little change, an already familiar ammonia turbocompressor TKA-545, and the pressure properties of the latter are graphically portrayed. The two fertilizer plants have tested the units, with practical success and 300,000 rubles yearly economy. Figures 4. [85-8586]

Biochemistry (See also USSR REPORT: Biomedical and Behavioral Sciences)

USSR

UDC 547.964.4

PRODUCTION OF THE B-CHAIN OF HUMAN INSULIN FROM THE B-CHAIN OF SWINE  
INSULIN

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1663-1664 manu-  
script received 29 Jan 79

SHVACHKIN, YU. P., VOLUYSKAYA, YE. N., KRASNOSHCHEKOVA, S. P., RYABTSEV,  
M. N., FUNTOVA, S. M., ZUYANOVA, T. I., Institute of Experimental Endocrin-  
ology and Hormone Chemistry, USSR Academy of Medical Sciences

[Abstract] A method has been developed for production of the B-chain of human insulin in the form of the bis-S-sulphonate from the corresponding derivative of the B-chain of swine insulin. The method is based on enzymatic-chemical transformation of the swine insulin sulphonate in a 4-stage scheme, the first stage of which is splitting of the compound by tripsyn. The second stage is treatment of the compound thus formed with vos-azide. The third stage is condensation of the compound thus produced with synthetic octapeptide, and the fourth stage is simultaneous removal of all of the protective groups from the compound thus formed with trifluoroacetic acid in the presence of anisol. Ion-exchange chromatography and gel filtration produce the product in analytically pure form.

[73-6508]

USSR

UDC 541.136

ELECTRICAL REDUCTION OF HYDROGEN PEROXIDE ON THE ELECTRODE WITH IMMOBILIZED  
PEROXIDASE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 249 No 6, 1979 pp 1399-  
1401 manuscript received 17 May 1979

YAROLOV, A. I., MALOVIK, V., VARFOLOMEYEV, S. D. and BEREZIN, I. V.,  
Corresponding Member of the Academy of Sciences of the USSR, The M. V.  
Lomonosov Moscow State University

[Abstract] The peroxidase from horseradish was purified to  $RZ=2.2$ , then enzyme activity in solution and immobilized states determined by a spectrometric procedure and electrochemical measurements taken by a potentiostatic method in 0.15 M of an acetate buffer solution at 20° C. A mixture with the stationary potential of the electrode showed positive values of +1.05 to +1.24, depending on the material of the working electrode, increasing in direct dependence on the specific surface of the electrode and being the

greatest with a carbon electrode. The cathode process was regarded to be connected with the electro-chemical reduction of the hydrogen peroxide. Adsorbed hemin did not catalyze the reaction. The pH value was dependent on the hydrogen peroxide content and was at the highest at a pH of 4.5. Peroxidase was involved as a molecular whole in the reaction. Figures 3; references 10: 3 Russian, 7 Western.  
[119-12131]

USSR

UDC 577.15.035+541.14+535.247+77.01

ARTIFICIAL LIGHT-SENSITIVE ENZYME SYSTEMS AS CHEMICAL REINFORCERS FOR WEAK LIGHT SIGNALS

Moscow USPEKHI KHIMII in Russian No 11, Nov 79 pp 1921-1942

BEREZIN, I. V. and MARSHINEK, KAREL, Moscow State University, Chemistry Department

[Abstract] A study of the overall nature of light-induced processes for amplification of weak light signals led the authors to the conclusion that the optimal process must be considered to be a system with a catalytic process following light stimulation, in that the action of the light produces molecules of a catalyst which then catalyze the chemical transformations of substances not sensitive to light present in the system. The fact that the world supply of silver is presently being exhausted forces the search for non-silver-based light-sensitive catalytic systems. This article discusses the possibility of using biological catalysts for this purpose. A system is studied which contains a catalytically inactive enzyme derivative which is converted to an active enzyme catalyst upon absorption of light quanta plus a substrate. The general principles of construction of artificial light-sensitive enzyme systems are thus discussed and various systems with light-sensitive effectors are mentioned, including those in which light regulates the rate of inactivation of enzymes, or the enzymatic activity, or the potential difference across a biological membrane. Systems with light-sensitive substrates are also discussed. There is no doubt that effective light amplifiers will be created on the basis of artificial light-sensitive enzyme systems in the very near future. The approaches to regulation of the rates of enzymatic reactions under the influence of light which are studied in this article should also be used in fundamental studies in the area of enzymology. Many of the enzyme systems mentioned in this review are very realistic models of more complex light sensitive systems functioning in vivo. Their analysis may assist deeper understanding of the principles used by nature for the same purposes. References 130: 36 Russian, 94 Western.  
[117-6508]



USSR

UDC 577.155.3

# THE KINETICS OF PHENYLACETAMIDE HYDROLYSIS BY IMMOBILIZED PENICILLINAMIDASE

Moscow BIOKHIMIYA in Russian Vol 44 No 8, 1979 pp 1377-1380 manuscript received 9 Nov 78

- MILMAN, I. A., GEYMAN, I. I. and SLAVINSKAYA, V. A., Institute of Organic Synthesis of the Latvian SSR Academy of Sciences, Riga

[Abstract] Phenylacetamide was hydrolyzed by using penicillinamidase immobilized in polyacrylamide gel. Penicillinamidase immobilized in polyacrylamide gel from E. coli ATCC 9637, produced at the Riga Plant of Medicinal Preparations was used in the study. The kinetic parameters of the reaction were determined in a thermostated flask 50 ml in volume at  $37.0 \pm 0.1^\circ$ . The kinetic data of the phenylacetamide hydrolysis reaction were processed both by using the initial rates and by using the integral form of the Michaelis-Menten equation. One of the reaction products in hydrolysis of phenylacetamide is phenylacetic acid. The nature of inhibition was not changed upon variation of the substrate, and phenylacetic acid also becomes a competitive inhibitor upon hydrolysis of phenylacetamide. The inhibition constant is equal to  $5.9 \cdot 10^{-4}$  M. Binding of the phenylacetic acid to the enzyme is considerably less effective upon hydrolysis of benzylpenicillin than in the phenylacetamide hydrolysis reaction. The type of substrate thus affects the effectiveness of binding the inhibitor. Figures 4; references 7: 1 Czech, 2 Russian, 4 Western. [46-6521]

USSR

UDC 577.150.8

# IMMOBILIZATION OF ENZYMES ON GLOBULIN

Moscow BIOKHIMIYA in Russian Vol 44 No 8, 1979 pp 1347-1352 manuscript received 23 Aug 79

RAKHIMOV, M. M., ZEMLYANSKAYA, N. R., AVLYANOVA, R. R. and TILLYABAYEVA, I. S., Central Asian Scientific Research Institute of the Food Industry, Tashkent

[Abstract] Immobilization of lipase and amylosubtilisin G10x on cotton globulin was investigated for the purpose of producing immobilized enzymes whose activity is regulated by the ionic force of the solution. The lipase was separated from cotton seeds and the conditions for determining its activity, the substrates used and the other conditions were the same as in

previous experiments. The advantages of immobilization in globulin include an increase of enzyme stability during storage and an increase of catalytic activity. Covalent immobilization of enzymes functioning in a heterogeneous medium results in a loss of activity, while enzyme immobilization on globulin permits this difficulty to be overcome. Enzymes immobilized on globulin can be easily converted from the insoluble to the soluble state and vice versa, with a corresponding change in catalytic capability. The catalytic activity of these enzymes correlates with the sodium chloride and other salt concentrations in the solution, which can be a measure of the ionic force of the solution, a unique enzyme detector of ionic force. One other important advantage of this process is that the globulin is the main component of nutritional protein from cottonseeds, which means that enzymes immobilized on globulin can be used to produce food products and at the same time may increase the biological value of globulin. Figures 5; references 8 Russian. [46-6521]

USSR

UDC 546.18+547.241

SYNTHESIS AND CERTAIN PROPERTIES OF TRIVALENT PHOSPHORUS ACID IODOANHYDRIDES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1446-1453 manuscript received 18 Jul 78

KABACHNIK, M. M., PRISHCHENKO, A. A., NOVIKOVA, Z. S. and PUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Trivalent phosphorus acid iodoanhydrides were first obtained by F. Bennett by the interaction of trifluoriodomethane with elementary phosphorus. The authors have developed a new method of synthesis of various trivalent phosphorus acid iodoanhydrides, consisting in the interaction of acid chlorides with magnesium iodide etherate. The reaction, which occurs easily at 20 C in a solution of ether, produces monoiodoanhydrides and diiodoanhydrides of these acids with high yields. The physical and chemical constants and data from elemental analyses are presented in tables. The products are clearly biphilic. The reaction of trivalent phosphorus esters with dialkylidodophosphines is an Arbuzov regrouping reaction and represents a new method for preparation of the phosphorus-phosphorus bond. References 20: 14 Russian, 6 Western.

[73-6508]

USSR

UDC 544.341+543.422.25

STRUCTURE OF  $\alpha$ -PHOSPHORYLATED ALDEHYDE OXIMES

Moscow ZHURNAL OBSHCHEY KHIMI in Russian No 4, Jul 79 pp 1453-1459 manuscript received 12 May 78

ZYABLUKOVA, T. A., PAVLOV, V. A., SOKOLOV, M. P., LIORBER, B. G., IL'YASOV, A. V., RAZUMOV, A. I. and ALPAROVA, M. V., Kazan' Institute of Chemical Technology imeni S. M. Kirov, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] A report is presented on a study of geometric isomers of  $\alpha$ -phosphorylated aldehyde oximes and determination of the influence of various factors, both internal and external, on the equilibrium of the content of the forms and the nature of the hydrogen bonds. The compounds are found to exist in two isomer forms, the syn-form being energetically more favorable than the anti-isomer form. The ratio of isomer forms varies as a function of the polarity and basicity of solvents and the temperature.  $^1\text{H}$ ,  $^{31}\text{P}$ NMR spectra and IR spectra are presented.

[73-6508]

USSR

UDC 547.241:543.422.25

**SYNTHESIS AND PROPERTIES OF LEUKOCOMPOUNDS OF PHOSPHORUS-CONTAINING DIARYLMETHANE DYES**

Moscow ZHURNAL OBSHCHEV KHIMII in Russian No 7, Jul 79 pp 1460-1464 manuscript received 6 Jul 78

BYCHKOV, N. N., BOKANOV, A. I. and STEPANOV, B. I., Moscow Institute of Chemical Technology imeni D. M. Mendeleev

[Abstract] A study is presented of the reaction of michler hydrol with the oxides of secondary phosphines and with the phosphines themselves. The reactions of diethyl phosphine oxide and secondary phosphines with michler hydrol are presented. All of the substances produced were studied by measurement of IR, UV and PMR spectra. The reaction products were tertiary phosphines and tertiary phosphine oxides containing bis (4-dimethylamino-phenyl) methyl groups at the phosphorus atom. Figure 1; references 15: 5 Russian, 10 Western.  
[73-6508]

USSR

UDC 547.284+546.183

**VINYL ESTERS OF PHOSPHORUS ACIDS. XVIII. PHOSPHORYLATION OF ACETONE THIOCYANATE**

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1464-1470 manuscript received 18 Jul 78

IVANOVA, ZH. M., KIM, T. V., BOLDESKUL, I. YE. and GOLOLOBOV, YU. G.

[Abstract] Continuing their study of the interaction of phosphorus chlorides with carbonyl-containing compounds with the  $\alpha$ -CH bond in the presence of bases, the authors introduced trivalent and pentavalent phosphorus chlorides into the reaction in the presence of acetone thiocyanate triethylamine. The reaction product is O-(1-thiocyanato-1-propine-2yl)-dichlorophosphate. When this product is reacted with trialkylphosphates, an Arbuzov reaction occurs forming O, O-dialkyl-O-[1-(O, O-dialkylphosphorylthiol)-1-propine-2-yl] phosphates. Trivalent alkoxychlorides act on acetone thiocyanate to form alkoxythiocyanate vinyl phosphites which, when heated, undergo intramolecular heterocyclization to form previously unknown 1, 3, 2-oxathiaphospholenes with a 4-coordinated phosphorus atom. References 14: 11 Russian, 3 Western.  
[73-6508]

USSR

UDC 547.412.72

# REACTION OF TRIALKYLPHOSPHITES WITH POLYHALOGEN METHANES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1470-1474 manuscript received 12 May 78

KUKHAR', V. P. and SAGINA, YE. I., Institute of Organic Chemistry, Ukrainian Academy of Sciences

[Abstract] It is demonstrated that when carbon tetrachloride, carbon tetrabromide and trichloromethane react with trialkyl phosphites, all of the chlorine atoms can take part in the reaction, producing monophosphorylated or biphosphorylated compounds depending on the ratio of the reagents used in the reaction. References 7: 3 Russian, 4 Western.  
[73-6508]

USSR

UDC 547.26'118+541.63

# ALKYL ESTERS OF ALKOXY (DIHALOGENO-AND ALKOXY HALOGENOPHOSPHONYL) ACETIC ACIDS AND THEIR DERIVATIVES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1474-1491 manuscript received 28 May 78

SHOKOL, V. A., KOZHUSHKO, B. N., PALIYCHUK, YU. A. and YEGOROV, YU. P.

[Abstract] A study was performed to see whether  $\alpha$ -chloroalkyl esters containing chlorine and electronegative substituents at the same carbon atom would enter into the Arbuzov reaction with dialkylhalogen- and alkyl dihalogenophosphites. It was found that dialkylchloro- and fluorophosphites, alkyl-dichloro- and difluorophosphites react with alkyl esters of alkoxychloroacetic acids to form alkyl esters of alkoxy (alkoxychlorophosphonyl)-, alkoxy (alkoxyfluorophosphonyl)-, alkoxy (dichlorophosphonyl)- or alkoxy (difluorophosphonyl) acetic acids. The corresponding derivatives are yielded with alcohols and amines. NMR  $^1\text{H}$ ,  $^{19}\text{F}$  and  $^{31}\text{P}$  spectra were used to study the diastereomer anisochroicity and diastereotopicity of the atoms of chlorine and alkoxyl groups at the phosphorus atoms of the organophosphorus compounds produced. It was found that the most convenient method for studying these phenomena is  $^{19}\text{F}$  NMR. References 22: 12 Russian, 10 Western.  
[73-6508]



USSR

UDC 547.341.26'118.07

N-SUBSTITUTION REACTIONS IN  $\omega$ -IMINO- $\omega$ -ALKOXYL ESTERS OF PHOSPHORUS ACIDS

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1491-1495 manuscript received 12 May 79

SHISHKIN, V. YE., YUKHNO, YU. M. and NO, B. I., Volgograd Polytechnical Institute

[Abstract] A previous report briefly discussed this synthesis of methylphosphonates with an N-substituted imino group in the ester radical. This report presents more complete data on the synthesis and certain properties of these methylphosphonates, as well as the reactions of  $\omega$ -imino and  $\omega$ -alkoxyalkyl esters of phenylphosphonic and phenylphosphoric acids with various electrophilic reagents occurring at the imino group. It is found that when alkyl- $\omega$ -imino- $\omega$ -alkoxyalkyl esters of phosphorus acids are interacted with carboxylic acid halides in the presence of triethylamine, substitution of hydrogen in the imino group occurs with the formation of N-acylated derivatives. References 3 Russian.

[73-6508]

USSR

UDC 547.558.1:543.422.2

ORTHO EFFECTS IN TRIARILPHOSPHINES. VI. STUDY OF ASYMMETRICAL COMPOUNDS BY  $^{13}\text{C}$  NMR

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1495-1498 manuscript received 12 Jul 78

NEGREBETSKIY, V. V., BOKANOV, A. I., ROZANEL'SKAYA, N. A. and STEPANOV, B. I., All-Union Scientific Research Institute of Chemical Compounds for Plant Protection, Moscow Institute of Chemical Technology imeni D. I. Mendeleev

[Abstract] Continuing their previous studies of the stereospecificity of the spectral parameters of triarylphosphines, the authors study the way in which a decrease in symmetry of molecules upon transition from trimesityl phosphine and trimesityl phosphine oxide to three related compounds with lower symmetry is manifested in the  $^{13}\text{C}$  NMR spectra. In all cases in the inhibited conformations of the asymmetrical compounds, the  $\text{C}^1$  atoms of rings a and b are nonequivalent. A difference in screening was also detected for  $\text{C}^4$  carbons in one compound and for  $\text{CH}_3$  groups in another. This means that in the inhibited conformations the mesityl rings a and b do not occupy equivalent positions. The results agree with the representation of the compounds as propeller-shaped molecules with aromatic rings at the tips of three propellers. Figure 1; references 5 Russian.

[73-6508]

## ESTERS OF PERFLUOROALKYLPHOSPHONOUS ACIDS

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1498-1501 manuscript received 10 May 78

MASLENNIKOV, I. G., LAVRENT'EV, A. N., KHOVANSKAYA, N. V., LEBEDEV, V. B. and SOCHILIN, YE. G., Leningrad Institute of Technology imeni Lensovet

[Abstract] Alkyl esters of trifluoromethyl-, pentafluoroethyl- and heptafluoropropylphosphonous acids were synthesized. In the synthesis of the phosphonites, the initial perfluoroalkyl diiodophosphines were reacted first with antimony trichloride to convert them to the corresponding chlorophosphines, which were then introduced to the reaction with the alcohols. It was found that in reactions of perfluoroalkyl dichlorophosphines with isopropyl alcohol, the primary products are acid isopropyl (perfluoroalkyl) phosphonites. The acid phosphonites are colorless liquids which react eagerly with aqueous alkali. Figure 1; references 8: 1 Russian, 7 Western. [73-6508]

## INTERACTION OF PERFLUOROiodoALKANES WITH TRIALKYL PHOSPHITES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1501-1503 manuscript received 10 Jul 78

CARABADZHIU, A. V., SHIBAYEV, V. I., LAVRENT'EV, A. N. and SOCHILIN, YE. G., Leningrad Institute of Technology imeni Lensovet

[Abstract] A study was made of the interaction of perfluoroiodoalkanes of the general formula  $R_FI$  ( $R_F = C_3F_7$  and  $iso-C_3F_7$ ) with a number of trialkyl phosphites. Cryoscopic titration of solutions of trialkyl phosphites with perfluoroiodoalkanes in cyclohexane was performed, which indicated that the interaction of perfluoroiodoalkanes with trialkyl phosphites leads to the formation of complexes of the composition 1:1, for which the equilibrium constants were determined. A 3-parameter correlation of the equilibrium constants of complexes with the induction, resonance and steric constants of the substituents of the phosphorus atom was detected. References 10: 7 Russian, 3 Western. [73-6508]

INTERACTION OF OXYMETHYLPHOSPHINES WITH ALIPHATIC ALDEHYDES AND THERMAL REGROUPING OF  $\alpha$ -OXYALKYLPHOSPHINES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1503-1508 manuscript received 31 Jul 78

VALETIDINOV, R. K., ZUYKOVA, A. N., ZYABLIKOVA, T. A. and IL'YASOV, A. V., Kazan' Affiliate, All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev, Institute of Organic and Physical Chemistry imeni Academician A. Ye. Arbuzov, Kazan' Affiliate, USSR Academy of Sciences

[Abstract] The authors discovered that carefully dried tri-(oxymethyl) phosphine and alkyl-di-(oxymethyl) phosphine interact energetically with aliphatic aldehydes. The most suitable solvent is triethylamine, since the end products are soluble in it while the unreacted tri-(oxymethyl) phosphine and side products of the reaction are not. The interaction of oxymethylphosphines with aliphatic aldehydes will also occur with no solvent. Subsequent extraction of the end products with triethylamine can achieve the same yields as when the reaction is performed in triethylamine. The main products of these reactions are tris-( $\alpha$ -oxyalkyl)- and alkylbis-( $\alpha$ -oxyalkyl)-phosphines. A diagram of the reaction is suggested. References 19: 10 Russian, 9 Western.  
[73-6508]

## INTERACTION OF 1-VINYLSILATRANES WITH ORGANOPHOSPHORUS COMPOUNDS CONTAINING THE P-H BOND

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1525-1528 manuscript received 29 Dec 78

VORONKOV, M. G., D'YAKOV, V. M., KUDYAKOV, N. M. and SIGALOV, M. V., Irkutsk Institute of Organic Chemistry, Siberian Division, USSR Academy of Sciences

[Abstract] Free-radical attachment of compounds of phosphorus containing the P-H bond to alkenylsilanes occurs by a radical-chain mechanism and is initiated by UV radiation or organic peroxides. The purpose of the present work was to study the reaction of attachment of organophosphorus compounds containing the P-H bond to 1-vinylsilatrane and its C-methyl derivatives, using dialkylphosphites and diphenylphosphine as examples. It was found that the attachment of dialkylphosphites to 1-vinylsilatrane in the presence

of an alkali metal alcoholate occurs in 5 to 6 hours, when initiated by UV light in 15 to 20 hours. The plan of the reaction is presented. The compounds produced are white crystalline substances or white yellowish oils which crystallize slowly upon storage and can be distilled in a high vacuum. The IR spectra are measured indicating that the compounds are 1-(2'-0, 0-dialkylphosphonoethyl)silatranes. References 4 Russian. [73-6508]

USSR

UDC 547.558.1

ACETYLTHIENYLENE TRIPHENYLPHOSPHONIUM. SYNTHESIS AND STUDY OF REACTIVITY

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1552-1556 manuscript received 10 Oct 78

BUKACHUK, O. M., MEGERA, I. V., PORUSHNIK, M. I. and SHEVCHUK, M. I.

[Abstract] Synthesis of two acetylthienylene-5-triphenylphosphonium bromide by heating of a mixture of triphenylphosphine and 2-acetyl-5-bromothiophene without a solvent is described. Due to a competing reaction for the oxygen of the acetyl group, significant quantities of triphenylphosphine oxide are also produced. The salt produced is a light green fine crystalline substance, easily dissolved in chloroform, DMPA, poorly soluble in water and alcohol. The IR spectrum contains a band of the carbonyl group at  $1665\text{ cm}^{-1}$ , bands at  $1150\text{--}1110$ ,  $1020\text{--}995$  and  $750\text{ cm}^{-1}$  characteristic of phosphonium salts, and also bands at  $1570$ ,  $1383$ ,  $1185$  and  $1050\text{ cm}^{-1}$  resulting from the 2, 5-disubstituted thiophene ring. Brief heating with a slight excess of an aqueous solution of potassium permanganate causes the acetyl group of this salt to be oxidized to a carboxyl group, producing a yellow crystalline phosphonium salt containing the carboxyl group--2-carboxy-5-triphenylphosphonium thienylene bromide. The IR spectrum of this salt contains the bands mentioned plus the carboxyl group band at  $3100\text{ cm}^{-1}$ . The reactivity of the salts is studied.

[73-6508]

USSR

UDC 547.241

# SYNTHESIS AND TRANSFORMATION OF METHYLDIIODOPHOSPHINE

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 p 1668 manuscript received 15 Dec 78

MEL'NICHUK, YE. A. and FESHCHENKO, N. G.

[Abstract] The interaction of cyclohexyl-benzyl- and tert-butyldichlorophosphines with lithium iodide produces alkylidithiophosphines and dialkyldiodobiphosphines or other compounds with the P-P bond. When methyl-dichlorophosphine is interacted with lithium iodide, the primary product is methyldiodophosphine (40-60%). No compound with the P-P bond is produced. Disproportionation by fractional distillation and heating are described. References 4: 3 Russian, 1 Western.  
[73-6508]

USSR

UDC 547.241+547.26'118

# METHYLBIS(TRIALKYLAMMONIUM IODIDE) PHOSPHINES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 p 1669 manuscript received 15 Dec 78

FESHCHENKO, N. G., MEL'NICHUK, YE. A., SEMASHKO, Z. T. and GUBNITSKAYA, YE. S., Institute of Organic Chemistry, Ukrainian Academy of Sciences

[Abstract] The authors found that when trialkylamines or N-organylaziridines are interacted with methyldiodophosphine in any ratio, methylbis (trialkylammonium iodide) phosphines are formed. They are colorless or light yellow crystalline substances, quite stable under ordinary conditions of storage out of contact with the moisture of the air in an inert atmosphere, soluble in polar solvents on strong electrolytes. Their composition was confirmed by elemental analysis, their structure by NMR <sup>31</sup>P spectra and chemical transformation. References 2: 1 Russian, 1 Western.  
[73-6508]



USSR

UDC 547.26'118:541.67

STERIC STRUCTURE OF METHYL-SUBSTITUTED 2-THIONO-2-CHLORO-1, 3, 2-DIOXAPHOSPHORINANES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 p 1670 manuscript received 14 Dec 78

PATSANOVSKIY, I. I., ISHMAYEVA, E. A., ZEMNITSKAYA, B., MIKOLAYCHIK, M. and PUDOVNIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin, Center of Molecular and Macromolecular Studies, Polish Academy of Sciences, Lodz

[Abstract] The steric structure of 1,3,2-dioxaphosphorinanes has been widely studied. There is great interest in study of the properties of molecules with known geometries, produced by stereospecific synthesis. The authors studied a number of compounds for which the molar Kerr constant (mK) and dipole moments at 25 C were determined. The conformations are described. References 5 Russian.  
[73-6508]

USSR

UDC 546.185

INTERACTION OF PHOSPHORUS PENTACHLORIDE WITH IMIDOYLGUANIDINES

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 p 1671 manuscript received 12 Dec 78

KORNUTA, P. P. and KOLOTILO, N. V., Institute of Organic Chemistry, Ukrainian Academy of Sciences

[Abstract] It was found that when imidoylguanidines are interacted with phosphorus pentachloride in a ratio of 1:2, 2-trichlorophosphazo-2, 4-dichloro-1, 3, 5-triaza-2-phosphorines are formed. The formation of the trichlorophosphazo group at the phosphorus atom is apparently a result of intramolecular regrouping. The mechanism is not described. References 3: 2 Russian, 1 Western.  
[73-6508]

USSR

UDC 547.26'118

SYNTHESIS OF TRIS(o-PHENYLENEDIOXY)PHOSPHORATE FROM PHOSPHAZO COMPOUNDS AND PYROCATECHIN

Moscow ZHURNAL OBSHCHEY KHIMII in Russian No 7, Jul 79 pp 1671-1672 manuscript received 9 Jan 79

KUKHAR', V. P., GRISHKYN, YE. V., KHRISTICH, A. I. and RUDAVSKIY, V. P.

[Abstract] It is found that various phosphazo compounds containing chlorine or a phenoxy group at the phosphorus atom react with an excess of pyrocatechin in the presence of triethylamine to form triethylammonium tris(o-phenylenedioxy)phosphate. The reaction probably occurs by successive formation of iminochlorophospholes and phosphorines. Dimers of trichlorophazo hydrocarbons also react with pyrocatechin and triethylamine to form phosphate. References 2: 1 Russian, 1 Western.

[73-6508]

USSR

UDC 542.91:547.1'118

SYNTHESIS OF N,N-DISUBSTITUTED 5-PHENYL-1,3,5-DIAZOPHOSPHORINANES AND DI(AMINOMETHYL)PHENYLPHOSPHINES

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKIKH NAUK in Russian No 1, 1979 pp 2771-2773

ARBUZOV, B. A., YERASTOV, O. A. and NIKONOV, G. N., Institute of Organic and Physical Chemistry imeni A. YE. Arbuzov, Kazan' Branch, Academy of Sciences USSR

[Abstract] Conditions are described for the reaction of di(hydroxymethyl)-phenylphosphine (I) with aniline, benzylamine, and p-toluidine and the resultant formation of 1,3,5-triphenyl-1,3,5-diazaphosphorinane, 5-phenyl-1,3-dibenzyl-1,3,5-diazaphosphorinane, and 5-phenyl-1,3-di-p-tolyl-1,3,5-diazaphosphorinane, respectively. The results indicated that reaction of I with amines constitutes an effective method for the preparation of N,N-disubstituted 5-phenyl-1,3,5-diazaphosphorinanes. In addition, reaction of (diphenylborylohydroxymethyl)hydroxymethylphenylphosphine with amines appears to be a general approach for the preparation of N,N-disubstituted di(aminomethyl)phenylphosphines. References 8: 1 Western, 7 Russian.

[91-12172]

USSR

UDC 542.91:547.1'118

# SYNTHESIS AND CERTAIN PROPERTIES OF QUASIPHOSPHONIUM SALTS

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKIKH NAUK in Russian  
No 1, 1979 pp 2783-2786

IVANOV, B. YE., KROKHINA, S. S., CHICHKANOVA, T. V., ZYABLIKOVA, T. A. and  
IL'YASOV, A. V., Institute of Organic and Physical Chemistry imeni A. YE.  
Arbuzov, Kazan' Branch, Academy of Sciences USSR

[Abstract] Conditions are described for the preparation of relatively stable  
quasiphosphonium salts by the reaction of hexaethyltriamidephosphite (I)  
with N-acetoxymethyl- and chloromethylamides of mono- and dibasic carboxylic  
acids, as well as with chloromethyldiethylamine, in the presence or absence  
of solvents. Increasing solvent polarity markedly reduced reaction tempera-  
tures ( $\text{MeCN} = 0^\circ\text{C}$ ,  $\text{CH}_2\text{Cl} = 10^\circ\text{C}$ ). Product structure was confirmed by IR and  
NMR spectra. Reaction of I with N-acetoxymethylbenzamide yielded hexaethyl-  
triamino(N-benzamidomethyl)phosphonium which decomposed via a pentacovalent  
intermediate to diethylacetamide and tatraethyldiamido(N-benzamidomethyl)  
phosphonate. Tables 1; figures 1; references 3 Russian.  
[91-12172]

USSR

UDC 542.91:547.1'118:547.455

# SYNTHESIS OF 1,2; 3-4-BIS-O-(N-DIETHYLAMIDOTHIONE)PENTAPYRANOSIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKIKH NAUK in Russian  
No 1, 1979 pp 2838-2839

NABIULLIN, V. N., ZININ, V. N. and MUKMENEV, E. T., Institute of Organic  
and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, Academy of  
Sciences USSR

[Abstract] Reaction of  $\text{p}(\text{NEt}_2)_3$  with unprotected aldopentoses--L-arabinose  
(I) and D-xylose (II)--at  $80-100^\circ$  in dry dioxane and  $\text{p}(\text{NEt}_2)_3$ :sugar ratio  
of 2:1 with subsequent addition of sulfur (dry dioxane at  $20^\circ$ )--led to the  
synthesis of previously undescribed 1,2; 3,4-bis-O-(N-diethylamidothione-  
phosphate)-beta-L-arabino- (in reaction with I) or alpha-D-xylopyranosides  
(in reaction with II). The structures were confirmed by elemental analysis  
and NMR spectra following chromatographic isolation on silica gel. Figures 1.  
[91-12172]

## ON THE CONFIGURATIONAL LABILITY OF FLUORIDE COMPOUNDS OF PHOSPHORUS WITH ETHYL SPIRITS AND DIPHENYLAMINE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 249 No 6, 1979 pp 1381-1385 manuscript received 23 Jul 1979

IL'IN, YE. G., NAZAROV, A. P. and BUSLAYEV, YU. A., Corresponding Member of the Academy of Sciences of the USSR, The N. S. Kurnakov Institute of General and Inorganic Chemistry, Academy of Sciences of the USSR, Moscow

[Abstract] The possibility of fixing adductive and alkoxyfluoride compounds of phosphorus was measured by nuclear magnetic resonance spectra of phosphorus 31 and fluorine 19 at temperatures from +30° to -60° C by adding PF<sub>5</sub> to CH<sub>3</sub>CN after initial drying with C<sub>2</sub>H<sub>5</sub>OH. The course of the reactions showed that the coordination number of the phosphorus signaled the formation of tetrafluorophosphane, which was regarded as an important factor in the dehydrofluorification reaction. This in turn led to changes in the coordination number of the fluorocompounds of stable elements with proton-containing donor ligands. Introduction of the proton into the acceptor systems suppressed the reaction. Figures 4; references 2 in English. [119-12131]

## DISTRIBUTION OF ELECTRON DENSITY IN PHOSPHORUS YLIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2401-2406

ZHMUROVA, I. N., YURCHENKO, R. I., TUKHAR', A. A., YURCHENKO, V. G. and VOYTSEKHOVSKAYA, O. M., Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR

[Abstract] Consideration was given to the electron donor properties of phosphinomethylene and phosphazo groups which are determined by the strongly polar p $\pi$ -d $\pi$  phosphorus-carbon or phosphorus-nitrogen bonds, relative to the adjacent organic moiety on the carbon or nitrogen atom. The addition of an aromatic group to the carbon or nitrogen atom makes it possible to utilize  $\sigma_p$  analysis for ranking such groups among the electron donor substituents, since substituents on the phosphorus atom have little influence on the electron donor properties of the phosphinomethylene or phosphazo groups. In addition, since only limited information is available on the ylide bond in the ylides of some other elements (Bi, S, As), an approach utilizing  $\sigma_p$

analysis may be used for studying the ylide properties of these elements in analogy to the use of this approach for phosphorus ylides. References 32 Russian.  
[95-12172]

USSR

UDC 541.121"543.241.5:547.1'118

SOLVENT EFFECTS ON THE RELATIVE EQUILIBRIUM PH ACIDITY OF DIPHENYLPHOSPHINE, AND DIPHENYLPHOSPHONOUS AND DIPHENYLTHIOPHOSPHONOUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2410-2414

PETROV, E. S., TEREKHOVA, M. I., MALAKHOVA, I. G., TSVETKOVA, YE. N., SHATENSHTEYN, A. I. and KABACHNIK, M. I., Physicochemical Institute imeni L. Ya. Karpov, and the Institute of Heteroorganic Compounds, Academy of Sciences USSR

[Abstract] In order to determine the effects of various solvents on the equilibrium acidities of diphenylphosphine (DPP), diphenylphosphonous acid (DPPA), and diphenylthiophosphonous acid (DPTPA), spectrophotometric determinations were made of the equilibrium constants of these PH acids and the pK values calculated. The results demonstrated that replacement of dimethylsulfoxide (DMSO) by the weakly polar 1,2-dimethoxyethane (DME) markedly enhanced the acid strength of DPPA in comparison with the acidity of DPTPA, which was ascribed to the greater association of the PO anion with the Li cation of indicator CH acids in DME than exhibited by the PS anion. The similar degree of acidity of DPP in DMSO and DME was ascribed to mutual compensation of the effects of ionic association in DME and anion solvation in DMSO. Introduction of an oxygen atom into the DPP molecule increases acidity by two pK units in DMSO, while addition of a sulfur atom increased the acidity of the PH bond by ten pK units. Tables 1; figures 1; references 14: 3 Western, 11 Russian.  
[95-12172]



USSR

UDC 547.341

#### MERCURIZATION OF ALPHA-ALKOXYVINYLPHOSPHONATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2414-2418

KAZANKOVA, M. A., SATINA, T. YA. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] IR, ESR, and NMR spectra were used in the identification of beta-mercuriated alpha-alkoxyalkenyldiisopropylphosphonates obtained by reaction of triisopropylphosphite and  $\text{HgCl}_2$  with alkoxyacetylene. This addition represents the first case of conjugated mercurization involving a previously coordinated Hg atom. Nucleophilic substitution of the Cl atom in beta-chloromercuri-alpha-chloroalkenylalkyls on reaction with triisopropylphosphite proceeds with retention of the Hg-C bond and leads to mercurized alpha-alkoxyalkenylphosphonates. Tables 2; references 7: 2 Western, 5 Russian.  
[95-12172]

USSR

UDC 547.241

#### TETRAALKYL(ARYL)DIPHOSPHINE MONOXIDES: SYNTHESIS AND REARRANGEMENTS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2418-2428

FOSS, V. L., SOLODENKO, V. A. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Several methods for the preparation of tetraalkyl(aryl)diphosphine monoxides were evaluated, with the conclusion that synthesis involving reactions of chlorophosphines with the sodium salts of phosphonous acids offers a number of advantages. The reaction is rapid enough even at low temperatures and in the presence of steric hindrance to allow for kinetic control of the process. The resultant products are either high boiling point liquids or solids that can be stored for prolonged periods of time under inert gas. Study of rearrangements involving monoxides of symmetrical and asymmetrical diphosphines indicated that the effects of Ph and Alk, or even Alk and tert-Alk, substituents were adequate to insure predominant stability of one of two isomeric monoxides due to both electronic and spatial factors. Tables 2; references 14: 5 Western, 9 Russian.  
[95-12172]

## MUTUAL CONVERSION OF MONOXIDES OF SYMMETRICAL DIALKYL DIALKOXYDIPHOSPHINES AND THEIR ISOMERIC ANHYDRIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2428-2433

FOSS, V. L., KUDINOVA, V. V. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Studies were conducted on the possibility of isomerization between the monoxides of symmetrical diphosphines,  $R(R'O)P(O)-P(OR')R$ , and their isomeric alkylphosphonous acids anhydrides,  $R(R'O)P-O-P(OR')R$ , based on the assumption of similar thermodynamic stabilities of these compounds and a tautomeric equilibrium. Evaluation of the results indicated that a tautomeric equilibrium prevails and that the anhydride fraction in the equilibrium increases with the increase in spatial hindrance of the radical R. The monoxides were prepared by reaction of sodium or lithium salts of alkyl-O-alkylphosphonous acids with alkylchlorophosphonites; anhydrides were obtained by the reaction of the alkylphosphonous acids with their acid chlorides in the presence of a tertiary amine. Tables 1; references 14: 5 Western, 9 Russian.  
[95-12172]

## STRUCTURE AND REACTIVITY OF CYCLIC ESTER AND NITRILE DERIVATIVES OF PHOSPHONACETIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2434-2437

OVCHINNIKOV, V. V., VALITOVA, V. M., CHERKASOV, R. A. and PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Spectroscopic and potentiometric studies were conducted on the effects of cyclic dioxalkylene substituents on the position of tautomeric equilibrium, acidity, and reactivity of cyclophosphonates with an active methylene group. The resultant observations on 4,5-dimethyl-2-carbomethoxymethyl-, 4,5-dimethyl-2-cyanomethyl-, and 4-methyl-2-carbomethoxymethyl-2-oxo-1,3,2-dioxaphospholanes, on 4-methyl-2-carbomethoxymethyl-2-oxo-1,3,2-dioxaphosphorinane, as well as on acyclic analogues demonstrated that 1,2-dioxalkylene substituents on cyclic esters and nitriles lead to ylide formation. In addition, kinetic and calorimetric studies demonstrated that

the 1,3,2-dioxaphospholane derivatives of phosphoacetic esters possess greater reactivity than the acyclic and six-membered cyclic analogues. Figures 1; references 12: 4 Western, 8 Russian. [95-12172]

USSR

UDC 547.341

INTERACTION OF ALKYL(ARYL)SULFENYLCHLORIDES WITH 3-ALKYL-1,2-ALKADIENE PHOSPHONATE DIALKYL ESTERS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2438-2442

ANGELOV, KH. M., VACHKOV, K. V., IONIN, B. I. and KIRILOV, M., Higher Pedagogical School, Shumen, Bulgaria, and the Leningrad Technical Institute imeni Lensovet

[Abstract] Studies were conducted on the reactions of alkyl(aryl)-sulfenylchlorides with 3-alkyl-1,2-alkadienephosphonate dialkyl esters at -12 to -8°C in nonaqueous apolar solvents (chloroform, tetrachloromethane, dichloroethane, etc.). Spectral (IR, NMR, ESR) and elemental analyses resulted in the identification of 4-alkyl(aryl)-thio-1,2-oxaphosphol-3-ene derivatives as the products of these cyclo-addition reactions. Tables 2; figures 2; references 10: 2 Western, 8 Russian. [95-12172]

USSR

UDC 547.241+547.341

REACTION OF CARBON TETRACHLORIDE WITH ALKYL ESTERS OF TRIVALENT PHOSPHORUS ACIDS IN BENZALDEHYDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2442-2446

KHARRASOVA, F. M., YEFIMOVA, V. D., BIKEYEV, SH. S. and SALAKHUTDINOV, R. A., Kazan' Chemical Technology Institute imeni S. M. Kirov

[Abstract] NMR spectroscopy was employed in the study of the reaction of  $\text{CCl}_4$ , in the presence of benzaldehyde, with triethylphosphite, the diethyl ester of ethylphosphonous acid, the dibutyl ester of para-chlorophenylphosphonous acid, methyl ester of para-tolylethylphosphonous acid, and ethyl diethylphosphonate. Among the products of the reactions of  $\text{CCl}_4$  with PIII

acid esters were compounds representing addition of trichloromethylcarbanion to a carbonyl carbon and subsequent transformations. Consequently, the reaction process involved a nucleophilic attack on the halogen with the formation of a halophosphonium cation and trichloromethylcarbanion. Tables 2; references 10: 1 Western, 9 Russian.  
[95-12172]

USSR

UDC 547.241+547.341

# REACTION OF TRIVALENT PHOSPHORUS ACID CHLORIDES WITH SATURATED ALDEHYDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2446-2452

NURTDINOV, S. KH., SAVRAN, V. I., ZYKOVA, T. V., SALAKHUTDINOV, R. A. and TSIVUNIN, V. S., Kazan' Institute of Chemical Technology imeni S. M. Kirov

[Abstract] Investigations were conducted on the reaction of acid chlorides of trivalent phosphorus acids ( $\text{PCl}_3$ ,  $\text{EtPCl}_2$ ,  $\text{PhPCl}_2$ ,  $\text{Et}_2\text{PCl}$ ) with acetaldehyde and butyraldehyde in 1:2 ratio in anhydrous benzene. NMR spectra revealed the exothermic formation of a mixture of organophosphorus compounds which could not be resolved after multiple distillations. Treatment of the adducts with  $\text{PCl}_5$  at 20-40°C resulted in the identification, on the basis of NMR, ESR, and IR spectra, of alpha-(1-chloroethoxy)ethyl derivative of the pentavalent phosphorus in the acetaldehyde experiment, and of alpha-(1-butenyloxy)butyl derivative of  $\text{P}^{(V)}$  in the case of the butyraldehyde experiment. Tables 2; figures 2; references 8: 4 Russian, 4 Western.  
[95-12172]

USSR

UDC 546.152+546.185

# REACTIONS OF PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2452-2458

KOSTINA, V. G. and FESHCHENKO, N. G., Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR

[Abstract] Investigations on the reactions of  $\text{PCl}_5$  showed that its interaction with phenol (1:1;  $5^\circ\text{C}$ ) leads to the formation of phenoxytetraiodophosphorane. Reaction with aniline or N-trimethylsilylaniline results in the substitution of either three iodine atoms with the formation of trianilidodiodophosphorane, or of four iodine atoms with the formation of tetraanilinophosphonium salt. In 1:1 reactions with tricyclohexylphosphine (I) the primary product tricyclohexyldiodophosphorane and I both react, in addition, with  $\text{POI}_3$  which is formed in the process and which acts as iodinating agent.  $\text{PI}_5$  was also found to give up iodine in reactions with triphenyldiodophosphorane, metallic mercury, and iodides of ammonia and phosphonium. References 8: 2 Russian, 6 Western. [95-12172]

USSR

UDC 547.241

# REACTION OF CARBOALKOXYMETHYLPHOSPHONITES WITH CARBON TETRABROMIDE. II.

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2458-2467

KOLODYAZHNYI, O. I., YAKOVLEV, V. N. and KUKHAR', V. P., Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR

[Abstract] Carboalkoxymethylphosphonites were found to react readily with  $\text{CBr}_4$  in ether at  $-60$  to  $-20^\circ\text{C}$  with the formation of P-bromilides and bromoform. The P-bromilides are unstable at  $0^\circ\text{C}$  or higher and decompose into an alkyl bromide and phosphorylated ketenes, while at lower temperatures they may be transformed into the more stable ylides. Ylide formation is dependent on the substituent on the phosphonite alpha-carbon, with the ylide yield increasing with the following substituent sequence:  $\text{CO}_2\text{R} > \text{Me}_3\text{Si} > \text{Ph} > \text{H}$ . Reaction of P-bromilides with amines produces carboalkoxymethyldaninophosphites identifiable on the basis of spectral data (IR, ESR, NMR) and the Wittig reaction with benzaldehyde. Tables 2; references 19: 8 Western, 11 Russian. [95-12172]



USSR

UDC 547.26'118+542.938+541.127

# ALKALINE HYDROLYSIS OF P-NITROPHENYL ESTERS OF PHOSPHORUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2470-2474

BEL'SKIY, V. YE., KUDRYAVTSEV, L. A., IL'INA, O. M. and IVANOV, B. YE.,  
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan'  
Branch, Academy of Sciences USSR

[Abstract] Studies were conducted on the kinetics of alkaline hydrolysis of the p-nitrophenyl esters of phosphinic, phosphonous, and substituted phosphoric acids in KOH or borate buffer, pH 9.18. Evaluation of the  $\lg k$  ( $k$  = liters/mole·sec at 25°C) data demonstrated that the nature of the substituent on the P atom markedly affects the reaction rate. Introduction of electron acceptor groups into the esters enhanced the reaction, while introduction of electron donors lowered the reaction rate constants. Tabular data are provided for the different groups and the  $10^7$ -fold difference in the rate constants that they induced. Tables 4; figures 1; references 19: 8 Russian, 11 Western.  
{95-12172}

USSR

UDC 547.241

# PHOSPHORYLATED AND THIOPHOSPHORYLATED ACYL(CARBAMOYL)ISOTHIUREAS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2474-2479

CHAPOV, A. F., VASIL'YEV, A. F., ZONTOVA, V. N., GALUSHINA, V. V. and MEL'NIKOV, N. N., All-Union Scientific Research Institute of Chemical Plant Protection, Moscow

[Abstract] On the basis of previous studies which demonstrated that phosphorylated and thiophosphorylated S,N-dialkylisothioureas exist in the imino form, attempts were made to shift the tautomeric equilibrium to the amino form through the introduction of electron acceptor substituents on the N<sup>2</sup> nitrogen atom of phosphinyl(thiophosphinyl)-S-alkylisothioureas (I). Evaluation of the IR and ESR spectra of the products obtained by acylation of I with acetic anhydride in pyridine, as well as with chloroacetyl chloride or trichloroacetyl chloride in the presence of triethylamine, and by carbamoylation of I with alkyl- and arylisocyanates, demonstrated that the products had the imino structure which was stabilized by intramolecular hydrogen bonds. Tables 2; figures 1; references 4 Russian.  
{95-12172}

USSR

UDC 547.558.1

PHOSPHORUS CONTAINING INTERMEDIATE PRODUCTS AND DYES. V. SYNTHESIS AND ABSORPTION SPECTRA OF NOVEL DERIVATIVES OF 4-AMINOPHENACYLTRIPHENYLPHOSPHONIUM

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2479-2487

KORMACHEV, V. V., PAVLOV, G. P., KUKHTIN, V. A. and TSEKHANSKIY, R. S., Chuvash State University imeni I. N. Ul'yanov

[Abstract] Conditions are described for the synthesis of previously undescribed derivatives of 4-aminophenacyltriphenylphosphonium in order to study the effects of phosphorus containing substituents on the absorption spectra. Evaluation of the IR spectra of the resultant products (4-acetamidophenacyltriphenylphosphonium iodide and chloride, 4-acetamidophenacylidenetriphenylphosphorane, 4-aminophenacylidenetriphenylphosphorane, 4-aminophenacyltriphenylphosphonium hydrochloride, 4-(4-dimethylaminophenylazo)phenacyltriphenylphosphonium iodide, 4-(4-dimethylaminophenylazo)phenacylidenetriphenylphosphorane) and the products of mutual conversion reactions indicated that the phosphonium salts existed in the ketone form in solid and liquid forms, with the exception of the 4-aminophenacyltriphenylphosphonium salts which enolize in the solid state. Tables 2; references 36: 6 Western, 30 Russian. [95-12172]

USSR

UDC 547.574+541.127

SOLVENT EFFECTS ON THE KINETICS AND INTERACTION MECHANISM OF ANILS WITH DIMETHYLPHOSPHITE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2592-2597

GARTMAN, G. A., PAK, V. D. and SIMONOVA, E. V.

[Abstract] ESR spectra were used in following the reactions of azomethines with dimethylphosphite at 30°C. The resultant data indicated that the increase in the rate constant of the benzal-p-toluidine reaction in the solvent series acetonitrile ( $0.65 \times 10^4$  liters/mole.sec), nitromethane ( $0.81 \times 10^4$ ), dichloromethane ( $1.01 \times 10^4$ ), 1,2-dichloroethane ( $1.15 \times 10^4$ ), chloroform ( $1.38 \times 10^4$ ), 1,4-dioxane ( $2.07 \times 10^4$ ), tetrahydrofuran ( $2.18 \times 10^4$ ), benzonitrile ( $2.39 \times 10^4$ ), benzene ( $3.02 \times 10^4$ ), and tetrachloromethane ( $3.09 \times 10^4$ ), which was attributed to an increase in the total solvent effect, was due largely to greater solvation of the activated complex than of either of the reactants. Evaluation of the reactions in the different solvents in

terms of the Hammett equation showed that a linear relationships prevailed between the Hammett  $\sigma$  and  $\sigma_p$  (where  $\sigma_p$  is the constant characterizing the substituent in solvent other than water). Tables 2; figures 4; references 4 Russian.

[95-12172]

USSR

UDC 547.853.7+547.241

#### NUCLEOPHILIC PHOSPHORYLATION OF CHLORINE DERIVATIVES OF 5-NITROPYRIMIDINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2614-2618

ONYS'KO, P. P., COLOLOBOV, YU. G., CHERKASOV, V. M. and BOLDYREV, I. V.,  
Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR

[Abstract] A series of pyrimidinylphosphonates were synthesized by reaction of trialkylphosphites with chloroderivatives of 5-nitropyrimidine in acetonitrile. NMR, ESR, and IR data on the products, in conjunction with elemental analyses, confirmed the molecular nature of the products and demonstrated differences in the spin-spin interaction constants of protons and phosphorus nuclei in the 2,4- and 4,6- positions on the pyridine ring. The latter observations indicated that reaction of trialkylphosphites with 2,4-dichloro-5-nitropyrimidine involved replacement of one or both chlorine atoms, depending on the ratio of the reactants; furthermore, the first chlorine atom to be replaced is in the ortho position to the nitro group. Tables 2; references 13: 6 Russian, 7 Western.

[95-12172]

USSR

UDC 542.91:547.1'.116

#### A NOVEL SEVEN-MEMBERED HETEROCYCLIC C-P COMPOUNDS: 11-OXO-11-PHENYL DIBENZO/b,f/PHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2622-2623

[Abstract] Reaction of 2H,8H-5-oxo-phenyldibenz/c,f/-1,5-oxaphosphacine with bases (sodium hexamethyldisilazanolate, sodium benzylamide) in absolute dimethylformamide for 2 h at 100°C led to the formation of a new heterocyclic C-P compound identified as 11-oxo-11 phenyldibenzo/b,-f/phosphine on the basis of spectral data and elemental analysis. Figures 2; references 1 Russian.

[95-12172]

USSR

UDC 547.24

ALPHA-ALKYLMERCAPTOTHIOVINYLDICHLOROPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2623-2624

GOLOBABOV, YU. G. and DANCHENKO, M. N.

[Abstract] Phosphorylation of methyldithioisopropionate by  $PCl_3$  in the presence of triethylamine resulted in the formation of alpha-methyl-mercapto-beta,beta-dimethylthiovinylchlorophosphite, whereas phosphorylation of ethyldithioisopropionate led to the formation of alpha-ethylmercapto-beta,beta-dimethylthiovinylchlorophosphate. The products were identified on the basis of spectral determinations (IR, NMR) and elemental analysis.

Figures 1; references 6: 1 Western, 5 Russian.

[95-12172]

USSR

UDC 547.26'118

PHOSPHAZO-AMIDE REARRANGEMENT IN IMIDOTHIOPIROPHOSPHATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2624-2625

GOLOLOBOV, YU. G., DUDCHENKO, T. N. and TUPCHIYENKO, S. K.

[Abstract] A phosphazo-amide rearrangement was detected in the phosphorylation of diethoxyphosphorylsulphenylchloride with an aminophosphite at  $-40^\circ\text{C}$  in ether in the presence of triethylamine, which resulted in the formation of O,O-diethyl(N-phenyl-N-diethoxyphosphoryl-amido)thionephosphate. The products was identified by means of IR and NMR spectra, physical constants, and elemental analysis. Figures 1; references 4: 1 Western, 3 Russian.

[95-12172]

USSR

UDC 547.466+547.76

PROTROPIC ISOMERIZATION OF FLUOROPHOSHAZO COMPOUNDS INTO FLUOROPHOSPHORANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2625-2627

NESTEROVA, L. I. and GOLOBOV, YU. G., Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR

[Abstract] Investigations on the  $\alpha$ -CH proton mobility of N-phosphorylated esters of aminocarboxylic acids indicated that reaction of an aminophosphite with phenylazide should yield either betaines or phosphoranes as a result of a prototropic shift to the N in the phosphazo group in the intermediate compound. Formation of phosphorinanes was confirmed by the identification of 2,2-difluoro-2-phenylamino-3-methyl-5-ethoxy-1,3,2-oxazaphospholine as the product of the reaction of phenylazide with ethoxycarbonylmethyl-N-methylaminodifluorophosphite. Figures 1; references 7: 1 Western, 6 Russian.  
[95-12172]

USSR

UDC 547.26'118

SYNTHESIS AND GEOMETRIC ISOMERISM of 2,5-DIETHOXY-5-EXO-1,3,2,5-DIOXADIPHOSPHORINANE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2627-2628

NIFANT'YEV, E. YE., LEGIN, G. YA., SOROKINA, S. F. and BORISENKO, A. A., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] NMR spectra were used in the identification of 2,5-diethoxy-5-oxo-1,3,2,5-dioxadiphosphorinane (I) formed as two geometric isomers from the reaction of the ethyl ester of dimethylolphosphonic acid with ethyldichlorophosphite at 0-10°C in pyridine. Addition of sulfur to I in boiling benzene resulted in the formation of 2,5-diethoxy-2-thio-5-oxo-1,3,2,5-dioxadiphosphorinane. Figures 2; references 1 Russian.  
[95-12172]



USSR

UDC 547.26'118

REACTION OF O-ALKYL-N-ALKYLAMINOCHLOROTHIOPHOSPHATES WITH ETHANOLAMINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2628-2629

KRONGAUZ, YU. I., ITSKOVA, A. L. and MANDEL'BAUM, YA. A., All-Union Scientific Research Institute for Chemical Plant Protection

[Abstract] Investigations on the reaction of the acid chlorides of phosphorus thioacids with ethanolamine showed that the latter was diphosphorylated, in addition to the formation of the corresponding thiophosphoric acid N-(2-hydroxyethylamides). At room temperature in xylol reaction of O-ethyl-N'-isopropylaminochlorothiophosphate with mono- and triethanolamine yielded N-[2-(O-ethyl-N'-isopropylamidothiophosphoryloxy)ethyl] amide of O-ethyl-N'-isopropylamidothiophosphoric acid and O-ethyl-N'-isopropyl-N-(2-hydroxyethyl)diamidothiophosphate. References 1 Russian.  
[95-12172]

USSR

UDC 547.241;547.442

13-HYDROXYCYCLO(7,3,1,0<sup>2,7</sup>)TRIDECEN-2(7)-YL-13-PHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 11, 1979 pp 2629-2630

VYSOTSKIY, V. I., VYSOTSKAYA, T. A., MASLENNIKOVA, I. G. and TILICHENKO, M. N., Far Eastern State University, Vladivostok

[Abstract] Equimolar concentrations of dialkylphosphite and tricyclo(7,3,1,0<sup>2,7</sup>) tridecane ketones were reacted in 4 N sodium alcoholate to yield six products identified on the basis of IR and ESR spectra and elemental analysis as 13-hydroxycyclo(7,3,1,0<sup>2,7</sup>)tridecen-2(7)-yl-13-phosphonates.  
[95-12172]

# CARBON DIOXIDE WILL BECOME CHEMICAL RAW MATERIAL

MOSCOW NAUKA I ZHIZN' in Russian No 8, 1979 p 63

[Article]

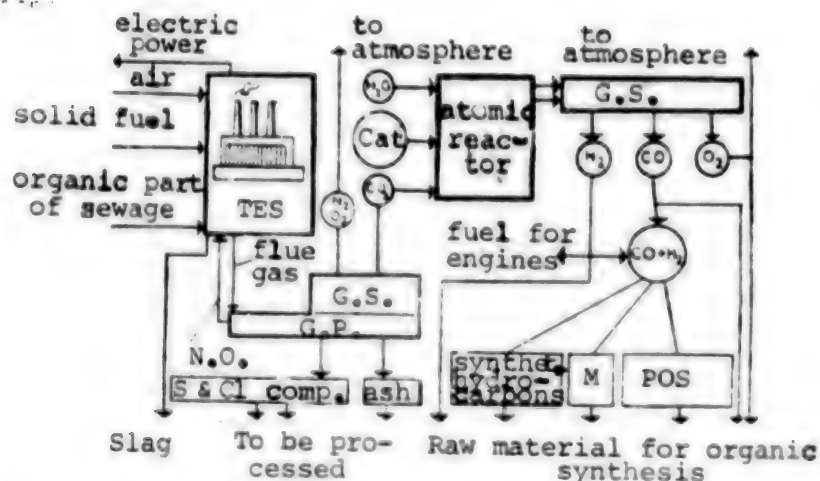
[Text] Over 5 billion tons of carbon dioxide are discharged into the atmosphere of our planet each year as a result of man's industrial activities. This colossal amount of carbon dioxide is formed primarily as a result of combustion of various fossil fuels in the furnaces of TES [thermal electric power plants], industrial furnaces and heat engines.

According to the existing data, not only will growth in consumption of oil, coal and shale fail to stop in the immediate future, it will even increase by 5% per year. Ultimately, according to the estimates of the American scientist, R. (Rotti), about 1000 billion tons of carbon dioxide will be discharged into earth's atmosphere in the next 5-10 years. The level thereof in our planet's aerosphere at the present time is of the same order ( $2 \cdot 10^{12}$  tons). Yet, according to existing forecasts, doubling the concentration of carbon dioxide in the atmosphere could result in a  $6^{\circ}$  increase in mean temperature on earth. This harbors the danger, in particular, of melting of glaciers and flooding of vast land regions.

Carbon dioxide pollution can be arrested by switching heat engines to another fuel, the combustion of which does not lead to formation of carbon dioxide. Hydrogen is such a fuel. Methods are being sought to recover it by separating sea water in high-temperature atomic reactors.

If this search is successful, a large amount of carbon dioxide will still be discharged by TES (operating by the usual systems) and industrial furnaces.

Prof V. K. Tsykovskiy and Prof L. S. Efros (Leningrad) propose a radical means of controlling carbon dioxide pollution, with their development of an idea of Academician F. D. Vitay of the Georgian Academy of Sciences. It refers to the fact that the carbon dioxide entering the atmosphere should become raw material for technological processes.



Key: N.O.) noncombustible organic matter  
 G.S.) gas separation  
 M) methanol  
 POS) products of oxo synthesis  
 Cat) catalyst  
 G.P.) gas purification

Heretofore, such processes did not exist (with the exception of synthesis of urea). Processing of carbon dioxide into carbon monoxide could be an important prerequisite for developing them.

Catalytic dissociation of carbon dioxide into carbon monoxide requires high-power sources of fuel. High-temperature atomic reactors could serve for this purpose (see NAUKA I ZHIZN' [Science and Life], No 12, 1971, p 23; No 9, 1977, p 116).

According to the diagram submitted above, along with recovery of carbon monoxide, there is also thermochemical separation of water into oxygen and hydrogen in the specially equipped atomic reactor. This is followed by preparation of a gas mixture (so-called gas synthesis), which is used as raw material to recover hydrocarbons, methyl alcohol and other products that are then processed into a wide spectrum of organic compounds.

The technology for recovering these products from carbon monoxide and hydrogen is well-known, and it has been tested by industry. Thus, the use of "waste" carbon dioxide makes it possible to obtain all of the chemical products and materials known to mankind; it could replace petroleum and gas as raw material.

[114-10,657]

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10,657

CSO: 1841

## REBUILT BASHKIR REFINERIES STEP UP OUTPUT

Moscow PRAVDA in Russian 18 Jan 80 p 2

[Article by A. Petrushov: "Saved...A Whole Plant, Roads of Technical Progress"]

[Excerpt] The Bashkir "Bashneftekhimzavody" Petrochemical Refineries Association produces a wide assortment of products including fuels, lubricants, road construction materials, mineral fertilizers, feedstock for plastics and the microbiological industry, and consumer goods. Having fulfilled the plan for the first 4 years of the five-year plan ahead of schedule, the association is striving from the first days of the new year to consolidate its successes. Since the beginning of January, products worth hundreds of thousands of rubles in excess of the plan goal were shipped to consumers

The Novo-Ufa Petroleum Refinery, a member of the association, is a relatively young enterprise. In the summer of 1951, gasoline was made here for the first time. The enterprise was among the first to earn the valued appellation of "Collective of Communist Labor." The Novo-Ufa enterprise fulfilled the tasks of the Ninth Five-Year Plan ahead of schedule and is now operating both well and at an even pace. Since the beginning of the five-year-plan period, production volume for petroleum products rose 18.5 percent as against a planned 15.9 percent; and labor productivity jumped 24.3 percent. The share of products certified with the mark of quality grew by a factor of 2.5. All of this was accomplished without an increase in space and with a reduction in the work force.

What was the reason for the growth? The principal factor for the acceleration turned out to be the reconstruction of production facilities for intensification of technological processes.

An interesting episode. The enterprise produces almost twenty types of industrial oils. This calls for frequent changes in the operating modes of equipment. Each such change results in losses of feedstock and of the finished product. Specialists then suggested an innovation which enabled the equipment to produce two types of oil simultaneously. As a result, product output sharply increased.

Modernization included here literally all links in the technological chain. At catalytic reforming, for example, the design of the main furnace was improved, a new flow chart was introduced, and the storage tank park was reconstructed. Results exceeded expectations. Thousands of gallons of high octane gasolines were produced more than specified in the four-year plan. At present, the refinery makes all gasolines with a high octane number. The reconstruction of the paraffin facility proved to be of great benefit. The new installation made possible a 15,000-ton annual increase in output.

The synthetic alcohol plant, producing more than ten types of products from crude petroleum stock and located not far from the Novo-Ufa refinery, is essential to the production of synthetic rubber, resins, plastics, herbicides, acetate silk and synthetic leathers. Since the beginning of the five-year plan, the enterprise was a prize winner eleven times in competition in the industry. During this time, the output of alcohols, polyethylene, acetone, phenole and of other products increased considerably; and more than half of the output earned the State Mark of Quality.

Unabated growth of output is also achieved here through planned modernization of equipment making possible a significant augmentation of production capacity. Thus, renovation helped to triple the designed output for the production of ethylbenzene; and the capacity of shops producing methylstyrene was doubled without new construction.

The work of the petroleum refinery, the oldest in the Bashkirskaya ASSR, is permeated with creativity. In 1976, the first large installation for the primary refining of crude attained its designed capacity; and, already in just 2 years, its productivity has been raised 17 percent, despite that modernization was effected during the period of capital repairs.

A. Yudayev, chief of the association, said that such examples can be adduced by the dozens.

The most effective road to success in construction and technical reequipping of production facilities done according to a precisely designed plan and strictly controlled by the association. By the end of just 4 years of the quinquennium, various production links adopted nearly thirty thousand organizational and technical measures and innovator-and-efficiency suggestions targeted for renovation of apparatuses and equipment, for improvement of the technology of petroleum refining and for augmentation of additional production capacities without requiring capital investment.

What was accomplished was equal to the cost of equipping and putting into operation a petrochemical enterprise with an annual production volume of 135 million rubles.

Not only a quantitative growth occurred here but a qualitative improvement as well. During this interval of time, production with the mark of quality rose by a factor of 2.2. The achievement is by no means small considering



the fact that the refinery processes high-sulfur crude; and half as much capital was spent as compared with appropriations which would have been required for the construction of new modern high-capacity facilities.

Competition for highest productivity and quality in technological remodeling was a significant factor in the high effectiveness of the reconstruction.

Competition is now supported by a new form of organization of labor, i.e., by the brigade, whose goal is the efficient use of labor resources. Thus, the adoption of the brigade method at the synthetic alcohol plant cut the work force by 115 persons, who were then transferred to the new shops producing phenol and acetone. More than 1,700 workers were displaced in the association as a whole and put to work in facilities newly put on line.

Crude oil from fields in the Bashkirskaya ASSR and West Siberia flows daily in a continuous stream without stopping to the refineries of the association.  
[120-P]

CSO: 1841

## ESTABLISHMENT OF REGISTER OF PETROLEUM WASTE PROPOSED

Moscow PRAVDA in Russian 11 Dec 79 p 2

[Article by G. Tolstikov, director of the Institute of Chemistry of the Bashkir Affiliate of the USSR Academy of Sciences, doctor of chemical sciences, Ufa: "Petroleum Has No Waste"]

[Text] It is well known that the combustion of petroleum hydrocarbons is an inexcusable waste. After all, a great number of valuable chemical products can be made from it. However, although the proportion of petroleum spent on chemical processing is increasing constantly, many components of the "black gold" do not yet find application. The production of most petrochemical products is accompanied by a highly substantial waste which often is burned. Yet it represents high-grade raw materials, from which many useful things can and should be produced for the country's national economy. An overall search based on the achievements of fundamental chemical science is the most efficient way of solving this problem.

Scientists at our institute together with the personnel of the Ufa Scientific Research Institute of Petrochemical Production and the Novo-Ufa Petroleum Refining Plant implemented a vast program of scientific investigations of nature and of the properties of organic sulphur compounds in the petroleum of the Urals, the Volga area and West Siberia. It has been established that most of these compounds belong to a special category of substances--sulfides--capable of forming compounds with nonferrous and noble metals. Utilizing this property, it was possible in contact with scientists in the Urals and Siberia--specialists in the field of flotation--to develop highly efficient, new methods of extracting from ores and cleaning a number of scarce and expensive metals.

In the course of further investigations it has been found that by means of very simple operations sulfides can be transformed into sulfoxides. Now, after their comprehensive study, there is every reason to speak with confidence about the development of a new category of organic reagents with unique properties and wide possibilities for practical application. Thus, the experience in the operation of industrial installations at hydrometallurgical enterprises has shown that in many cases they can be used

throughout the technological "thread" beginning with ore flotation and ending with bringing metal to a high degree of purity. Sulfoxides are also capable of trapping harmful admixtures from sewage and waste gases and of separating valuable products from technological solutions. The economic benefit from the introduction of sulfoxides is estimated at 40,000 rubles per ton of reagent.

Furthermore, jointly with the All-Union Scientific Research Institute for the Collection, Preparation and Transport of Petroleum in Ufa, we succeeded on the basis of sulfoxides to obtain compositions for the manufacture of corrosion resistant insulating covers of main petroleum and gas pipelines. According to the estimates of specialists, the economic benefit from the introduction of new covers will average 17,000 rubles per km of pipeline.

The transformation of petroleum sulfides into sulfones is a highly promising trend in their utilization. They have manifested themselves as solvents of a selective action making it possible to create improved flow charts for the extraction and cleaning of a number of chemical products. A very high floating activity has been established in sulfones, which makes them valuable reagents for hydrometallurgy.

In time the useful properties of sulfides, sulfoxides and sulfones will require a large-scale organization of their industrial production. The question of the synthetic production of these reagents arises. In connection with this it is necessary to approach in a new way the utilization of a number of components of natural gas and gas condensates in Orenburg and Volga deposits. Nature gives us reagents, which can be transformed into sulfides and sulfoxides. Bashkir scientists are now engaged in a search for the best solution of this problem.

Discussing the problem of development of waste-free techniques, the matter of large-tonnage waste cannot be bypassed. In most cases it can be transformed into valuable products. However, it is not always simple to do this. The fate of some fractions of pyrolysis, which are excellent raw materials for the production of synthetic rubber, epoxy resins, paint and varnish materials and other valuable products, is still complicated. The matter is at a standstill because of the lack of an overall approach to the problem. To find it is an urgent goal of Bashkir chemists.

On the other hand, production waste often represents substances ready for use without any additional chemical processing. For example, for many years piperazine--a known agent for the treatment of helminthiasis in animals--was the waste of one of the production processes at the Kaustik Association. By common efforts association specialists and workers at the Institute of Chemistry and at the Ufa Petroleum Institute developed a technique for the extraction of piperazine. This produced tens of tons of a highly scarce preparation.

As experience convinces us, the waste of petrochemical enterprises can find application. At times, however, the following question arises: Where and how to obtain the necessary information? Probably, the time has come to establish a statewide register of waste, which would have information on its accurate chemical composition, tonnage and prospects for growth or decrease. The institutes of the academies of sciences and sectors, as well as the appropriate departments of higher educational institutions, should be periodically acquainted with these data. Incidentally, these organizations, to be sure, can participate in the preparation of the register. I am confident that many academic and scientific research institutes and departments of higher educational institutions will readily respond to the proposal on the organization of work devoted to finding new technologies based on waste.

In the accountability report of the CPSU Central Committee to the 25th party congress Comrade L. I. Brezhnev stated the following: "The success of the scientific and technical revolution and its beneficial effect on the economy and on all the aspects of society's life cannot be ensured by the efforts of scientific workers alone. The involvement of all the participants in public production and of all the links of the economic mechanism in this historically important process acquires an ever greater role." Bashkir scientists do not leave the most promising developments in their portfolio, but submit them to workers and engineering and technical personnel in industrial enterprises for discussion. This creates an atmosphere of mutual trust, without which joint creative work is inconceivable.

[88-11439]

11,439

CSO: 1841

USSR

UDC 542.91:547.512:547.339.2

#### INTERACTION OF CYCLOPROPENE HYDROCARBONS WITH TETRACYANOETHYLENE

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKAYA in Russian No 12, 1979 pp 2706-2711

ZOTOVA, S. V., BOGDANOVA, V. S. and NESMEYANOVA, O. A., Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR, Moscow

[Abstract] IR, ESR, and NMR spectra were employed in identifying the products resulting from reacting several cyclopropene hydrocarbons with tetracyanoethylene (TCE). The results showed that reacting 1-methylcyclopropene with TCE led to the formation of 1-methyl-3-(alpha, alpha',-beta, beta'-tetracyanoethyl)cyclopropene in 90% yield. The mechanisms did not involve cycloaddition but a transfer of the allyl H to TCE and a shift in the double bond on the 3-membered ring. Reaction of TCE with 1-methyl-2-deuteriocyclopropene led to the expected formation of 1-methyl-3-deutero-3-(alpha, alpha'-beta, beta'-tetracyanoethyl)cyclopropene. Reaction of TCE with 3,3-dimethylcyclopropene and 1,3,3-trimethylcyclopropene led, respectively, to 2-methyl-3-(2',2',3',3'-tetracyanocyclopropyl)propene-2 and 2,3-dimethyl-3-(2',2',3',3'-tetracyanocyclopropyl)propene-2. These findings indicated that addition of TCE to the double bond of the cyclopropenes occurs only in the absence of allyl hydrogens. Tables 1; figures 2; references 14: 2 Russian, 12 Western.

[91-12172]

USSR

UDC 542.91:547.414:8:541.515:547.781

#### INTERACTION OF ALPHA-HALOIDALKYLNITRONS--DERIVATIVES OF THE NITROXYL RADICALS OF 3-IMIDAZOLINE-3-OXIDE--WITH NUCLEOPHILIC AGENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKAYA in Russian No 12, 1979 pp 2711-2717

GRIGOR'YEV, I. A., MARTIN, V. V., SHCHUKIN, G. I. and VOLODARSKIY, L. B., Novosibirsk Institute of Organic Chemistry, Siberian Branch, Academy of Sciences USSR

[Abstract] IR and UV spectra in combination with thin layer chromatography were used to identify the products of the interaction of 4-bromomethyl-2,2,5,5-tetramethyl-3-imidazoline-3-oxide-1-oxyl (I) and 4-(1-bromomethyl)-2,2,5,5-tetramethyl-3-imidazoline-3-oxide-1-oxyl with N', C-, S-, and O-nucleophilic agents, and the substitution of I for Br and reaction with dehydrobrominating reagents. Evaluation of the results showed that reaction of I



with hydroxylamine and tertbutylhydroxylamine leads to oxime and N-tert-butyl nitron derivatives of 1-oxy-4-formyl-2,2,5,5-tetramethyl-3-imidazoline-3-oxide. Reaction of 4-bromomethyl-3-imidazoline-3-oxide with NaNH<sub>2</sub> results in 1,1-elimination of HBr with formation of trans-bis(2,2,5,5-tetramethyl-3-imidazoline-3-oxide-1-oxyl-4-yl)ethylene, while reaction of 4-(1-bromoalkyl)-3-imidazoline-3-oxides with 1,5-diazabicyclo[5,4,0]undecene-5 yields alpha, beta unsubstituted nitrons. Tables 2; references 15: 4 Western, 11 Russian. [91-12172]

USSR

UDC 542.97:547.261

#### CATALYTIC SYNTHESIS OF METHANOL FROM CO<sub>2</sub> AND H<sub>2</sub> IN THE PRESENCE OF SnCl<sub>4</sub>

Moscow IZVESTIYA AKADEMII NAUK SSSR--SERIYA KHIMICHESKIKH NAUK in Russian No 1, 1979 pp 2769-2770

LAPIDUS, A. L., PIROZHKOV, S. D. and KORYAKIN, A. A., Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR, Moscow

[Abstract] SnCl<sub>4</sub> was tested for catalytic activity in the direct synthesis of methanol from CO<sub>2</sub> and H<sub>2</sub>, based on the detection of trace levels of methanol when SnCl<sub>4</sub> was used as a catalyst for carboxylation of ethylene by CO<sub>2</sub>. Maximum yields of methanol (8.2%) were found in an autoclave reaction at 200°C after 12 h under 100 atm pressure (25 atm pCO<sub>2</sub>, 75 atm pH<sub>2</sub>) and 3 ml of SnCl<sub>4</sub>. Trials with TiCl<sub>4</sub> and SbCl<sub>4</sub> were unsuccessful. Tables 2; references 1 Russian.

[91-12172]

## SELECTIVE THERMAL CONTACT PYROLYSIS OF HEAVY PETROLEUM FRACTIONS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 3-6

90SKIND, D. M., SPEKTOR, G. S., BARSUKOV, YE. YA. and BERMAN, L. A., All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] In developing their system for pyrolysis of heavy petroleum raw materials and selecting the basic principle for contact catalysis and heat and mass transfer, the authors decided to use powdered coke formed in the process itself as the heat-transfer medium. Powdered coke is easily mixed with the raw material and transported. The necessary practical experience has been gained in organization of pneumatic transport, fluidization and desorption in other processes of catalytic and thermal contact cracking. Powdered coke, as one of the products of the process, does not need to be delivered and prepared for use as a heat-transfer medium. It also has the necessary heat capacity, strength, refractoriness and low erosivity. A schematic diagram of the pyrolysis installation is presented. Selective pyrolysis of residual petroleum fractions and crude oil by this method can produce gaseous unsaturated hydrocarbons with good yield, although it produces less ethylene than pyrolysis of gasoline. However, this is compensated by the high yield of propylene and butylene, as well as the production of highly aromatized liquid products which can be used directly or as raw materials for the extraction of aromatic hydrocarbons. Figure 1; references 12: 7 Russian, 5 Western.  
[82-6508]

USSR

UDC 665.656.2

LOW-TEMPERATURE ISOMERIZATION OF N-HEXANE AND GASOLINE FRACTIONS ON  $\text{AlCl}_3$ - $\text{SbCl}_3$  CATALYSTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 6-8

RYABOV, V. G., SOLOMONOV, A. B., BUGAYCHUK, A. M. and PONOSOV, A. YE., Perm' Polytechnical Institute

[Abstract] A study is made of the influence of the quantity of catalyst containing aluminum chloride in a melt of antimony trifluoride and the duration of contact between raw material and catalyst on the yield of isohydrocarbons in the reaction of low-temperature isomerization on Friedel-Crafts catalysts. The studies were performed in a laboratory rocking autoclave at 120-130 C and 0.6-0.8 MPa using n-hexane as a model hydrocarbon and also using gasoline fractions. The reaction products were analyzed on an LKHM-8MD chromatograph. The studies determined the optimal conditions for low-temperature isomerization: catalyst raw material ratio 1/10 (by mass); content of  $\text{AlCl}_3$  in catalyst melt 25% (mol). Figures 4; references 5: 1 Russian, 4 Western.  
[82-6508]

USSR

UDC 66.048:661.725.031.6

PROCESSING OF THE HEAD FRACTION FROM PRODUCTION OF 2-ETHYLHEXANOL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 16-17

KUZ'MINA, L. S., MAYOROVA, L. V. and FROLOVA, A. L.

[Abstract] In the production of 2-ethylhexanol by hydrogenation of 2-ethylhexenal, about 20% "head" fraction is produced, a complex mixture of hydrocarbons and alcohols. To use this head fraction, it must be separated, which is a difficult process. The authors attempted to use the head fraction in the production of butyl alcohols by a naphthenate-evaporate scheme in combination with the production of 2-ethylhexanol after the head fraction was attached to the hydrogenate and the high-boiling products, including  $\text{C}_8$  alcohols and aldehydes, were separated, a distillation column was used to separate the head fraction. A laboratory column with an effectiveness of 30 theoretical plates was used, with the addition of about 3% water. The process separated about 95% of the butenals, and 2-ethylhexanol in the head fraction. Figure 1; references 3 Russian.  
[82-6508]

USSR

UDC 66.822.313:665.666.45:665.6[571.1]

**S-150 SULPHONATE ADDITIVE BASED ON THE OIL FRACTION OF WESTERN SIBERIAN PETROLEUM**

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 25-27

ROBINOVICH, I. L., CHERMENIN, A. P., ZHURBA, A. S. and FIALKOVSKIY, R. V., All-Union Scientific Research and Planning-Design Institute for Petrochemistry

[Abstract] An experimental batch of calcium medium-alkaline sulphonate additive called S-150 was produced at the Dorgobych Experimental Plant. The raw material used was deparaffinized oil from western Siberian petroleum. The additive was compared to sulphonate additives produced both in the USSR and abroad. The new additive was found to be superior to domestic additives PMS type B and PMS'ya in its content of active ingredient. The stability of a colloidal suspension of the experimental additive in the presence of water was superior to a foreign specimen. Laboratory testing showed that oils containing the experimental additive met the requirements of the technical conditions for lubricating oils. References 3 Russian.  
[82-6508]

USSR

UDC 62-734.3:665.658.2:543.872

**INFLUENCE OF NAPHTHENIC-AROMATIC HYDROCARBONS ON OXIDIZABILITY OF RT HYDROGEN-PURIFIED FUEL**

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 27-31

VESELYANSKAYA, V. M., RADCHENKO, YE. D., ENGLIN, B. A. and KIR'YANOVA, A. A., All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] A study was made of the extent to which hydrocarbons such as tetralines and indanes influenced the oxidizability of hydrogen-purified fuel. Tetraline, indane, acenaphthene, indene, styrene and alpha-methylstyrene were introduced in quantities of 0.2% to various jet fuels and oxidized by 12-times heating to 120°C in isolation from metal. The influence of these substances on the oxidizability of the fuels was determined. Both saturated and unsaturated naphthenic-aromatic hydrocarbons were found to influence the oxidizability of fuels significantly. The formation of high-molecular colored products and sediment upon oxidation of the fuel resulted primarily from the presence of heteroorganic compounds in the fuels. Desulfurification of the fuels is an effective preventive measure.  
[82-6508]

USSR

UDC 629.7.063.6.662.753:621.317.335.3

#### DIELECTRIC PROPERTIES OF PETROLEUM LUBRICATING OILS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 31-34

SNITSEROV, YU. V., KLYSHKO, A. A. and KUZNETSOV, D. I.

[Abstract] The dielectric properties of lubricating oils must be known in order to develop electric instruments used to control chemical and technological processes, determine the quality of petroleum products, measure levels, flow rates, etc. The most frequently used indices are the dielectric permeability and dielectric losses. This article presents a systematic study of these properties for a number of domestic petroleum oils used in turbine engines. The results of the experimental determinations of  $\epsilon$  and  $\tan \delta$  of the oils at temperatures from -50 to +200 C are presented in tabular form. Figures 2; references 8 Russian.

[82-6508]

USSR

UDC 661.185:665.614

#### SURFACE-ACTIVE COMPONENTS OF PETROLEUM EMULSION STABILIZERS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 12, 1979 pp 38-41

MAKHONIN, G. M., PETROV, A. A. and BORISOV, S. I., Giprovestoknef

[Abstract] Asphaltenes and microcrystals of paraffin cannot assure high stability of petroleum emulsions. Another component must be present--petroleum surface-active agents. These substances are adsorbed onto the surface of the asphaltene and paraffin microcrystal particles, creating hydrophilic sectors which cause the particles of stabilizer to accumulate and stay on the drops of emulsified water. This article studies the structural-mechanical properties of the protective layers of stabilizer on drops of emulsified water, the content and structure of petroleum surface-active agents. Petroleum emulsion stabilizers from 4 types of petroleum were studied by extraction of the petroleum with a mixture of methanol and acetone to remove the high-boiling fraction, then determining the surface activity by studying the interphase tension for 1% toluene solutions at the boundary with distilled water at room temperature. The surface activity of the fractions of stabilizers and petroleum appears to be determined not only by porphyrins, but also by other components with polar functional groups. References 13: 12 Russian, 1 Western.

[82-6508]



USSR

UDC 541.127.541.128.34

THE REACTION OF METHANE-ETHYLENE COMPOUNDS UNDER MODERATE CONDITIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 249 No 6, 1979 pp 1380-1381 manuscript received 26 Jul 1979

YENIKOLOPYAN, N. S., Academician, GYULUMYAN, KH. R. and GRIGORYAN, E. A.,  
The Chernogolovka Section of the Institute of Chemical Physics, Academy of  
Sciences of the USSR, Chernogolovka, Moscow Oblast'

[Abstract] In the presence of the catalytic system tetrabutoxytitantriethylaluminum at 20°C and atmospheric pressure in a benzene medium, methane was shown to react with ethylene to form propane molecules, yielding more or less than 15% in 10 hours. Activation of the C-H bond brought the formation of olefin molecules under moderate conditions. References 3 Russian.  
[119-12131]

USSR

UDC [661.7:547.295].002.237

PRODUCTION OF SYNTHETIC FATTY ACIDS WITH ADDED HEAT TREATMENT OF THE OXIDATION PRODUCT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 12, Dec 79 pp 718-720

DROZDOV, A. S., DIDENKO, Z. V., DEYNIKINA, N. I., POTATUYEV, A. A. and  
MIRONOV, YU. A.

[Abstract] Heat treatment of oxidized paraffin has been shown to improve its quality and to reduce the consumption of sodium sulfate as well as of sulfuric acid and by-products in the production of fatty acids. This is done in the liquid phase at 320°C under a pressure of 30 kgf/cm<sup>2</sup> with 2-5% water present. An experiment with a 2-ton sample from the Volgodonskiy Chemical Plant was made using 10-20% water at the same temperature but under a much higher pressure of 95-100 kgf/cm<sup>2</sup>. Examination of the oxidized paraffin by capillary gas chromatography and analysis of the fatty acids along with the nonsaponifiables subsequently produced from it indicate that inclusion of such a heat treatment in the process does, indeed, yield a better product more economically. A capital investment of 1,236 thousand rubles for this will reduce the cost of producing fatty acids by 12 rubles/ton and will save the plant 1,190 thousand rubles a year for scarce materials. Figures 1; tables 3; references 3 Russian.  
[92-2415]

## STERANES OF SURAKHANY CRUDE

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 828-832 manuscript received 9 Nov 78

USHAKOVA, I. B., ZAIKIN, V. G., GENEKH, I. S. and SANIN, P. I., Institute of Petrochemical Synthesis imeni A. V. Topchiyev

[Abstract] A method for isolating sterane concentrates from the crude of the Surakhany Deposit (Baku) is described. The method is based on driving off the fractions with boiling points of  $\leq 350^{\circ}\text{C}$  and removing asphaltenes (by precipitation with peptane), tarry matter, and aromatic hydrocarbons from the residue. Thereupon the residue is vacuum distilled. The amount of the selected fraction with b.p.  $450-520^{\circ}\text{C}$  at atmospheric pressure was 17.6% of the amount of the original crude. The fraction thus isolated was treated with thiocarbamide, and the resulting steranes were further concentrated by adsorption on aluminum oxide. Chromatographic analysis of the resulting concentrate led to the identification of three steranes with  $\text{C}_{27}-\text{C}_{29}$  composition: 5  $\alpha$ -cholestane, 5  $\alpha$ -ergostane, and 5  $\alpha$ -stigmastane, along with six methylsteranes of the  $\text{C}_{28}-\text{C}_{30}$  composition: two isomers each of 4-methylcholestane, 4-methylergostane, and 4-methylstigmastane. The total content of steranes in Surakhany crude was  $\sim 0.3\%$ . The predominance of ergostane and particularly of stigmastane points to the participation of vegetable matter in the genesis of this crude. Figure 1; references 21: 7 Russian, 14 Western. [79-1386]

## HIGH-BOILING AROMATIC HYDROCARBONS OF ANASTAS'YEVSK CRUDE

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 833-838 manuscript received 11 Jul 78

ZUBENKO, V. G., GORDADZE, G. N. and PETROV, AL. A., Institute of Geology and Development of Fossil Fuels

[Abstract] The structural features of monoaromatic hydrocarbons of Anastas'yevsk crude, which have boiling points of  $>420^{\circ}\text{C}$ , were investigated by means of adsorption chromatography on silicagel and aluminum oxide, as well as by means of mass spectrometry. A number of monoaromatic hydrocarbons belonging in two different groups--one with three naphthene rings and the other with four--was isolated. It is concluded that these hydrocarbons

derive from the aromaticization of hydrocarbons of the hopene series. Mass-spectral data on a synthesized monoaromatic hopene preclude the aromaticization of the D ring in the hydrocarbons of the second group, and hence it can be assumed that, in the process of the conversion of the crude, the hopene-series hydrocarbons underwent a change consisting in the broadening of the E ring into a cyclohexane ring with its subsequent aromaticization. Figures 2; references 7: 4 Russian, Western.  
[79-1386]

USSR

UDC 547.652.1

#### SYNTHESIS OF FUSED-RING POLYCYCLOAROMATIC HYDROCARBONS ON THE BASIS OF ISOMERIC XYLENES AND METHYLNAPHTHALENES

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 839-844 manuscript received 17 Oct 78

SKOROKHOVA, T. S., IVANOV, G. N., LUK'YANOV, V. I. YUR'YEV, YU. G., KAM'YANOV, V. F. and MERKUSHEV, YE. B., Tomsk, Institute of Petroleum Chemistry, Siberian Affiliate of the USSR Academy of Sciences; Tomsk State Pedagogical Institute

[Abstract] Until now coal tars have been the principal source of polycycloaromatic hydrocarbons (PCH), while the synthesis of PCH from petroleum crude has remained relatively uninvestigated. In this connection, it is shown that discrete polynuclear aromatic compounds of differing structure can be synthesized by combining techniques of photochemical cyclization and so-called anil synthesis--a new method for obtaining styrylarenes, based on condensing methylarenes with anils of aromatic aldehydes in such a way that from one to four styryl residues can be introduced into an aromatic ring during a single stage. By combining these techniques the authors were able to synthesize picene, 5,6-benzchrysene, chrysene, 3,4-benzphenanthrene, and fulminene, on the basis of isomeric xylenes and methylnaphthalenes. These newly synthesized PCH can serve as laboratory models for research into the composition of complex natural hydrocarbon systems. Figure 1; references 20: 6 Russian, 14 Western.  
[79-1386]

USSR

UDC 547.21:[542.952+542.971.3]

CATALYZING OF CONVERSIONS OF n-PENTANE AND n-HEXANE WITH THE AID OF  $\text{HSO}_3\text{F-SbF}_5$

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 850-855 manuscript received 20 Jun 78

TABATSKAYA, A. A., TSKHAY, L. E., BORISOVA, T. P. and SOKOLENKO, V. A., Tomsk, Institute of Petroleum Chemistry, USSR Academy of Sciences

[Abstract] Complex catalyst systems represented by superstrong acids ( $\text{HSO}_4\text{F-SbF}_5$ ,  $\text{HF-SbF}_5$ , etc.) deposited on inert porous carriers are gaining increasing attention in petrochemical processes. In this connection, the applicability of certain oxides ( $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ), as well as of aluminosilicate and Zeolite NaX as carriers for  $\text{HSO}_3\text{F-SbF}_5$  and the behavior of the resulting systems were investigated when used as catalysts for the isomerization and disproportionation of pentane and hexane. It is found that in every case the resulting superstrong acid-carrier systems are active and adequate catalysts of these reactions at room temperature. The interaction between the acid and the carrier results in the formation of a complex catalyst whose selectivity when used to catalyze isomerization is lower than the selectivity of carrier-free acid. The activity of the solid complex catalyst is found to depend not only on the surface area and pore size of the carrier but also on the carrier's acid-basic properties. The specific features of the investigated acid-carrier systems will be considered in a separate investigation. Figures 2; references 10: 9 Russian, 1 Western. [79-1386]

USSR

UDC 547.218.1:665:644.26

HYDROCRACKING OF n-HEXADECANE AND VACUUM DISTILLATES OF CRUDE WITH THE AID OF ZEOLITE-CONTAINING CATALYST IN THE PRESENCE OF ORGANIC COMPOUNDS OF NITROGEN

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 856-861 manuscript received 26 Jan 79

ZELENTSOV, YU. N., SAFONOV, G. A., OSIPOV, L. M. and PLYUSNIN, A. N., Angara Petrochemical Combine; Tomsk, Institute of Petroleum Chemistry, Siberian Affiliate of the USSR Academy of Sciences

[Abstract] Hydrocracking is a major and increasingly used process in the refining of heavy crude, and it is chiefly based on the use of zeolite-containing catalysts which are adversely affected by the presence of organic

compounds of nitrogen. In this connection, the hydrocracking of n-hexadecane with and without quinoline--a common ingredient of nitric bases of crude--as well as of the 340-490°C vacuum-distilled fraction of West Siberian crude with and without nitric bases, performed with the aid of GK-8 zeolite-containing catalyst, was investigated. It was found that the presence of nitric bases markedly reduces the degree of breakup, hydrogenation, and isomerization during the hydrocracking, apparently owing to the inhibition of the active centers of zeolite by the nitric bases. Analysis of discrete fractions of hydrogenates obtained during the hydrocracking of vacuum distillate at various pressures showed that under the above conditions the naphthene cycles forming during the hydrogenation of aromatic hydrocarbons are virtually unamenable to breakup. Figure 1; references 4 Russian. [79-1386]

USSR

UDC 66.092.147.3

#### EFFECT OF THE NATURE OF DILUENT ON THE CATALYTIC PYROLYSIS OF PETROLEUM CRUDES

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 862-868 manuscript received 10 Jul 78

ADEL'SON, S. V., VORONTSOVA, T. A., ZHANSHIN, M. ZH., IVANKOVSKIY, B. L., NIKONOV, V. I. and SOKOLOVSKAYA, V. G., Moscow Institute of Petrochemical and Gas Industry imeni I. M. Gubkin

[Abstract] Catalytic pyrolysis of petroleum crude has the potential for producing higher yields of ethylene and butadiene than does the thermal process. In this connection the effect of the degree of dilution of the charge with steam and of the nature of the diluent (steam, nitrogen) on the yields of such principal products of catalytic pyrolysis as propane, n-hexane, n-heptane, and straight-run gasoline in the presence of such catalysts as  $KVO_3$ , K-6, and K-15, was investigated. For each of these products the optimal ratio of dilution with steam or nitrogen was found to differ. Once that optimal ratio is exceeded, the conversion and yield of the gaseous products decrease. This may be attributed to the dissociative adsorption of steam as well as to the interaction of steam with the relatively inactive radical-like surface compounds of allyl type. By contrast with thermal pyrolysis, in catalytic pyrolysis the degree of conversion and yields of gaseous products are affected by the nature of the diluent used: when steam is used, the conversion and yields are roughly 1.5-2 times as high, compared with the use of nitrogen as the diluent. References 21: 16 Russian, 1 Hungarian, 1 Romanian, 3 Western. [79-1386]



USSR

UDC 66.094.38

# AMINO BENZOQUINONES AS INHIBITORS OF HIGH-TEMPERATURE OXIDATION OF SYNTHETIC OILS

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 902-907 manuscript received 31 Jan 78

ZEYNALOVA, G. A., BAKHSHI-ZADE, A. A., KYAZIM-ZADE, A. K., PORTYANSKIY, A. YE. and IBAB-ZADE, A. K., Baku, Institute of the Chemistry of Additives, AzSSR Academy of Sciences

[Abstract] The inhibition of the oxidation of synthetic oils by various aminobenzoquinones at 200-250°C (operating temperatures of synthetic oils) was investigated as a function of the absorption of oxygen by a synthetic oil (pentaerythritic ester of synthetic fatty acids of the C<sub>5</sub>-C<sub>9</sub> fraction). It was found that, of the aminobenzoquinones investigated, 2,5-di(n-butyl-amino)-n-benzoquinone displayed the highest antioxidant activity. Compared with the antioxidant activity of phenol-type inhibitors, the activity of aminobenzoquinones is less temperature-dependent. In the experiments performed in the presence of steel, copper, and aluminum plates it was found that, unlike the phenols, aminobenzoquinones produce a deactivating effect on the catalytic activity of metals. The thermooxidation resistance of synthetic oils is particularly enhanced when they are treated with a composite antioxidant additive consisting of both an aminobenzoquinone and a bis-(phenol) inhibitor. Figures 2; references 28: 24 Russian, 4 Western. [79-1386]

USSR

UDC 547.279.3:621.892.099.6

# SYNTHESIS AND INVESTIGATION OF CERTAIN DISULFIDES AS ANTIWEAR ADDITIVES TO LUBRICATING OILS

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 908-911 manuscript received 14 Feb 78

KULIYEV, A. B. and ALIYEV, F. YU., Baku, Institute of Chemistry- of Additives, AzSSR Academy of Sciences

[Abstract] Disulfides whose molecule contains both surface-active (C = O) and chemically active (-S-S-) components were for the first time investigated from the standpoint of their suitability as anti-wear additives of lubricating oils. The specific disulfides investigated were benzyl- and heptylacyldisulfides, synthesized by reacting benzyl- and heptylmercaptides with acyl chlorides in alcohol. Both types of chlorides were found to

effectively reduce wear, but generally benzylacyldisulfides were more effective than heptyl acyldisulfides. The presence of the C=O group in the disulfide molecule reduces the wear index and the wear spot diameter, by contrast with the compounds lacking that group. The reason for the effectiveness of the carbonyl group in the disulfide molecule is its high polarity which, in the presence of friction between the electronegative oxygen of the carbonyl group and the metal surface, results in polar interaction (adsorption) and the formation of resistant adsorption films. Figure 1; references 5: 3 Russian, 2 Western.  
[79-1386]

USSR

UDC 542.978:535.379

#### INVESTIGATION OF ANTIOXIDANT ACTIVITY OF HYDROCARBON OXIDATION INHIBITORS IN VASELINE OIL

Moscow NEFTEKHIMIYA in Russian No 6, 1979 pp 912-920 manuscript received 27 Oct 78

SHMULOVICH, V. G. and GOL'DENBERG, V. I., Scientific Research Institute of Biological Tests of Chemical Compounds

[Abstract] The antiradical activity of 13 different inhibitors was investigated by the chemiluminescence method in vaseline oil in the presence of initiated oxidation (70°C), as was their antioxidant activity in the process of autooxidation (170°C) of the oil. A correlation between antiradical activity and antioxidant activity was established for some of the inhibitors. The stoichiometric inhibition factor  $f[\text{InH}]_c$  of the natural antioxidants present in vaseline oil and their corresponding antiradical activity constants  $k_7/\sqrt{k_6}$  were determined by the chemiluminescence method. This method was also used to investigate the interaction between synthetic inhibitors and the natural inhibitors present in vaseline oil. The presence of a synergic effect upon interaction with natural inhibitors was established for ionol, 2,4,6-tri-tert.-butylphenol, and thiodiethyleneglycol ester of 4-oxy-3,5-di-tert.-butylphenylpropionic acid. The addition of sulfur-containing inhibitors with phenol and amine groups during the stage of a developed oxidation of vaseline oil (170°C) was found to produce critical effects due to the fact that these compounds are polyfunctional inhibitors which repress the oxidation process both through interaction with peroxide radicals and through the breakdown of hydroperoxides. Figures 4; references 19: 18 Russian, 1 Western.  
[79-1386]

## TYPE ANALYSIS OF ORGANOSULFUR PETROLEUM COMPOUNDS AND THE METHODS OF SULFURIC ACID EXTRACTION AND ADSORPTION CHROMATOGRAPHY

Moscow NEFTOKHIMIYA in Russian No 6, 1979 pp 921-926 manuscript received 13 Jun 78

LYAPINA, N. K., PARFENOVA, M. A., NIKITINA, T. S., VOL'TSOV, A. A. and NIKITINA, V. S., Ufa, Institute of Chemistry, Bashkir Affiliate of the USSR Academy of Sciences

[Abstract] The existing procedures for isolating and identifying the organosulfur compounds present in petroleum distillates are intricate and complex. In this connection the effect of two different isolation techniques--sulfuric acid extraction and adsorption chromatography--on the reliability of type analysis of the organosulfur compounds thus isolated from the 190-360°C diesel-oil distillates of medium- and high-sulfur crudes- was experimentally compared. It was found that the organosulfur compounds in the principal structural groups--thiacyclanes, thiaindanes, alkylthiophenes--showed just about the same stability at extraction by either method. However, the sulfuric-acid method should be practiced at lower temperatures since acyclic dialkyl-, alkylcycloalkyl- and alkylarylsulfides are stable only at low temperatures when extracted by this method. Certain fused-ring organosulfur compounds such as thiaindanes, dibenzothiophenes-, and naphthobenzethiophenes, moreover, are not amenable to the sulfuric acid method. On the whole, both methods show satisfactory convergence of findings, which should assist in further exploration of the complex composition of natural organosulfur compounds. References 12: 9 Russian, 3 Western.

[79-1386]

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